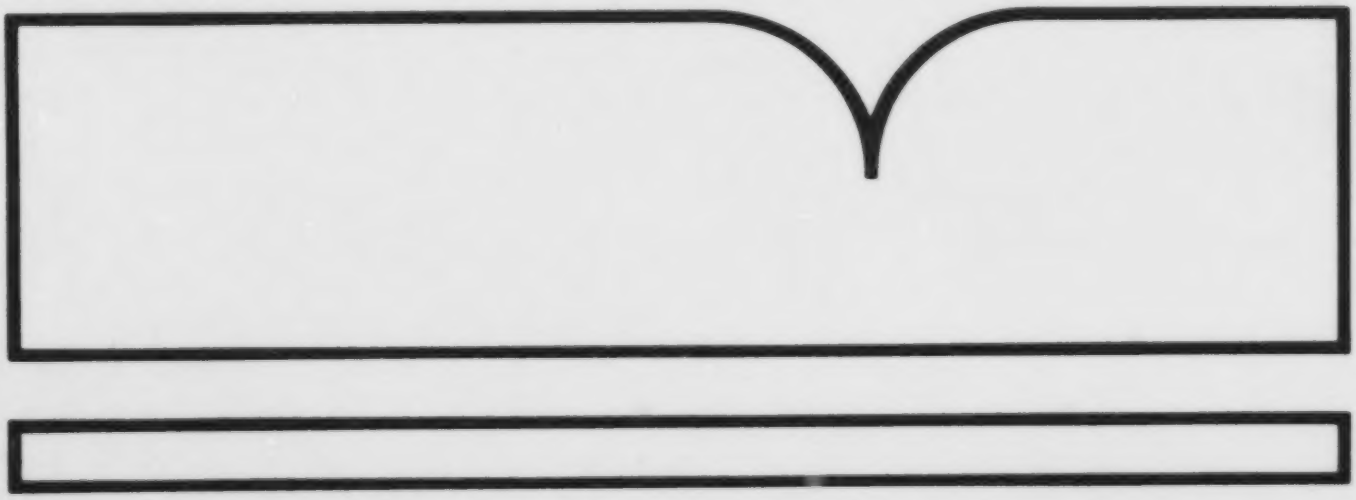
PB86-233541

Steady-State Efficiency, Temperature, and Pressure Data for Nine Aftermarket Catalysts

(U.S.) Environmental Protection Agency
Ann Arbor, MI

Jul 86



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16. ABSTRACT

This report presents graphical data showing the steady-state efficiencies, temperatures, and pressures determined in the testing of nine aftermarket catalysts by EPA.

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a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
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Technical Report

Steady-State Efficiency, Temperature, and Pressure Data for Nine Aftermarket Catalysts

by

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K. H. Hellman

July 1986

NOTICE

Technical Reports do not necessarily represent final EPA decisions or positions. They are intended to present technical analysis of issues using data which are currently available. The purpose in the release of such reports is to facilitate the exchange of technical information and to inform the public of technical developments which may form the basis for a final EPA decision, position or regulatory action.

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Background

This report presents graphical data showing the steady-state efficiencies, temperatures, and pressures determined in the testing of nine aftermarket catalysts by EPA.

After an FTP test was completed, the test vehicle was run over the following test modes:

Speed (MPH)	Road Load Horsepower
0	12.2
20	12.2
40	12.2
60	12.2
20	18.3
40	18.3
60	18.3

The 12.2 hp value for road load is the nominal setting for the test vehicle. The 18.3 hp value represents approximately a 50 percent increase. During the test sequence emissions, temperature, and pressure were measured upstream and downstream of the catalyst. This allowed the calculation of catalyst efficiency, temperature change, and pressure drop across the catalyst at each point.

The temperature and temperature change data are reported in degrees Fahrenheit. The pressure and pressure drop data are reported in inches of water. The pressure data were screened using the fact that the pressure drop across the catalyst has to be positive for each test point. Temperature data were not so screened, although there are cases, e.g., the data for catalyst #1(1-1) at 0 miles, where such screening may have been appropriate.

As in previous reports, the aftermarket oxidation catalysts tested are coded as follows:

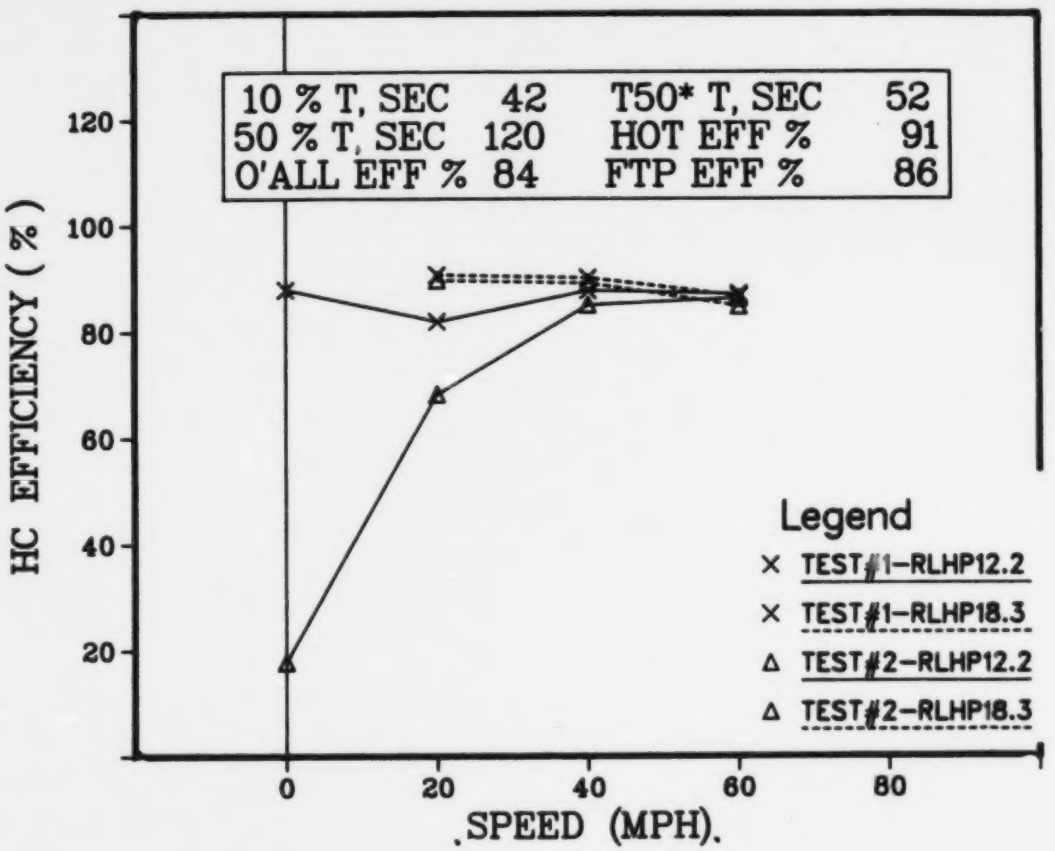
Catalyst Identification	Manufacturer	Type
#1(1-1)	Walker #1	Monolith
#2(1-2)	Walker #2	Monolith
#3(1-3)	Walker #3	Monolith
#4(2-1)	Echlin #1	Pellet
#5(2-2)	Echlin #2	Pellet
#6(2-3)	Echlin #3	Pellet
#7(3-1)	Brown #1	Monolith
#8(3-2)	Brown #2	Monolith
#9(3-3)	Brown #3	Monolith

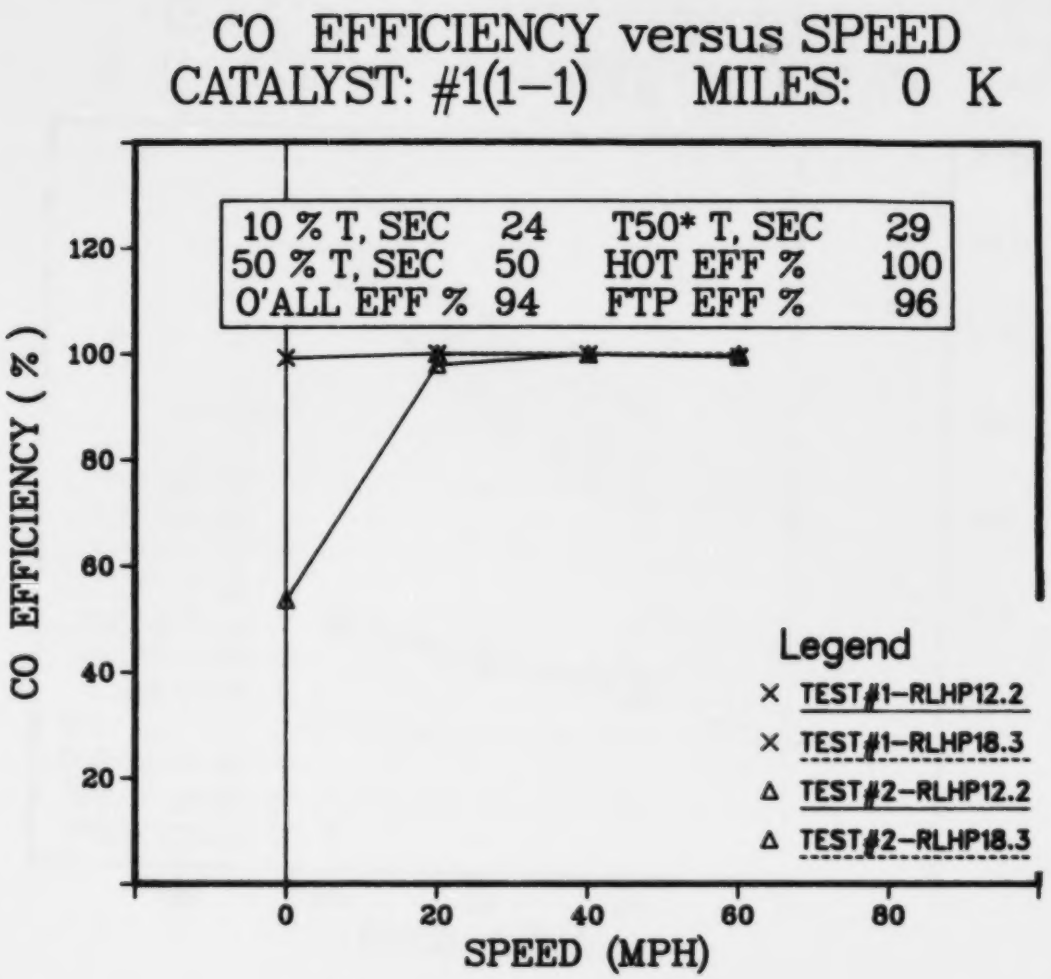
The data are presented graphically for each catalyst for each test mileage point. If multiple tests were run at each point they are shown separately. Graphs of HC efficiency, CO efficiency, temperature and temperature change, pressure and pressure drop complete the data for each catalyst/mileage point combination.

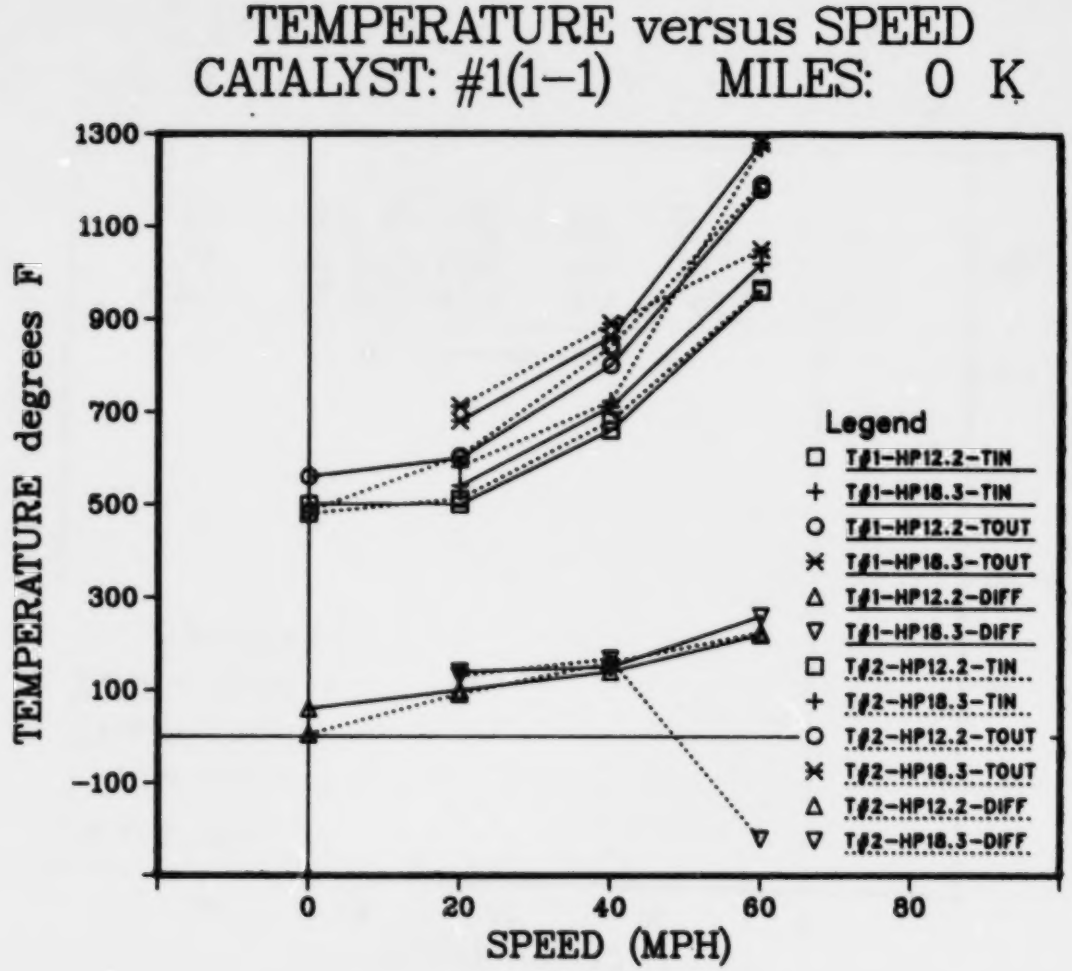
The data exhibit a good deal of scatter at the lower (0 and 20 MPH) speeds. Generally, the data show less variability at 40 and 60 MPH.

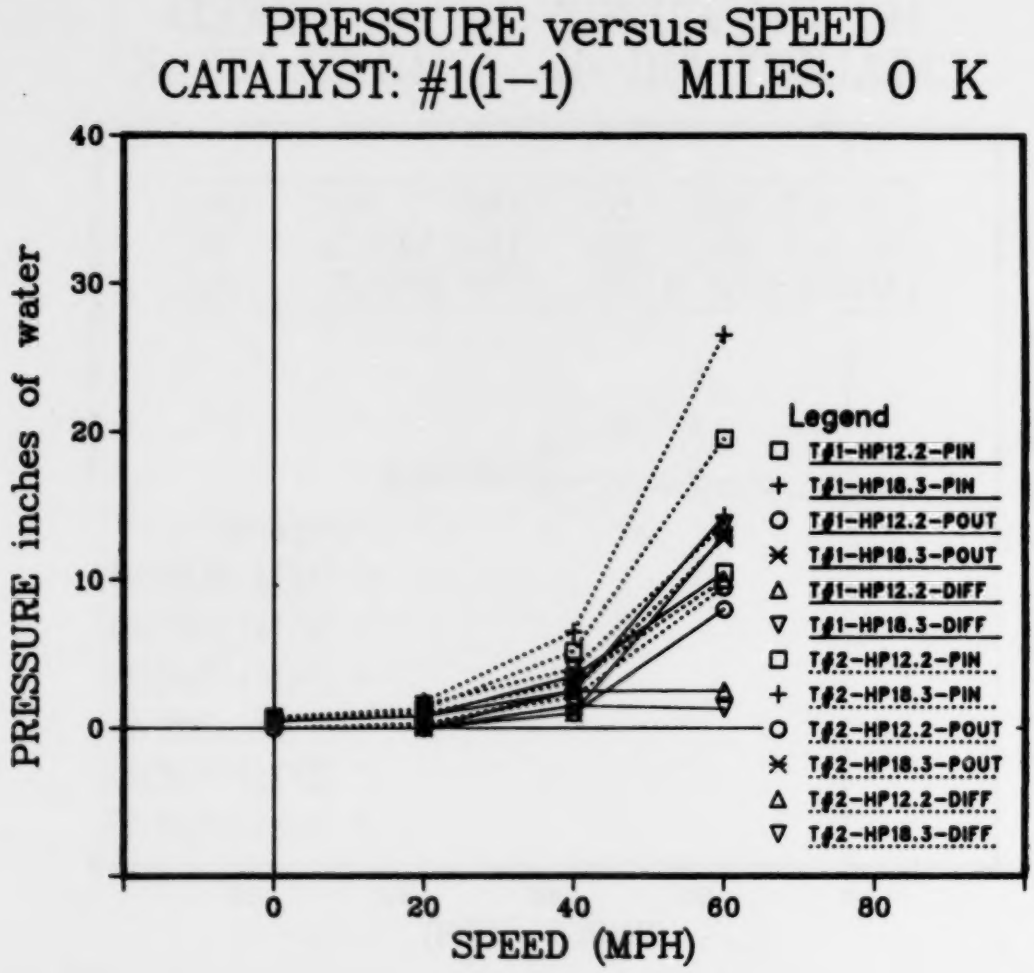
The same data that were used for the graphical presentation are shown in tabular form after the graphs.

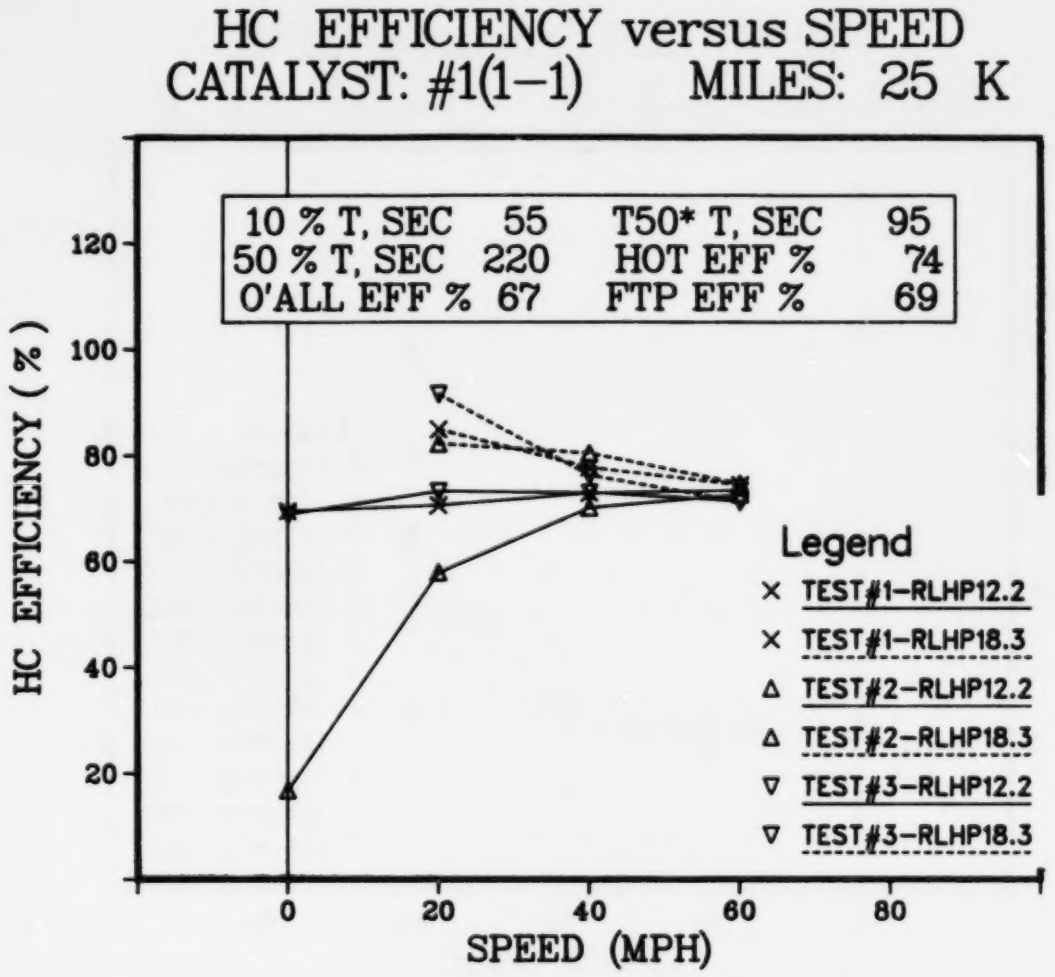
HC EFFICIENCY versus SPEED
CATALYST: #1(1–1) MILES: 0 K



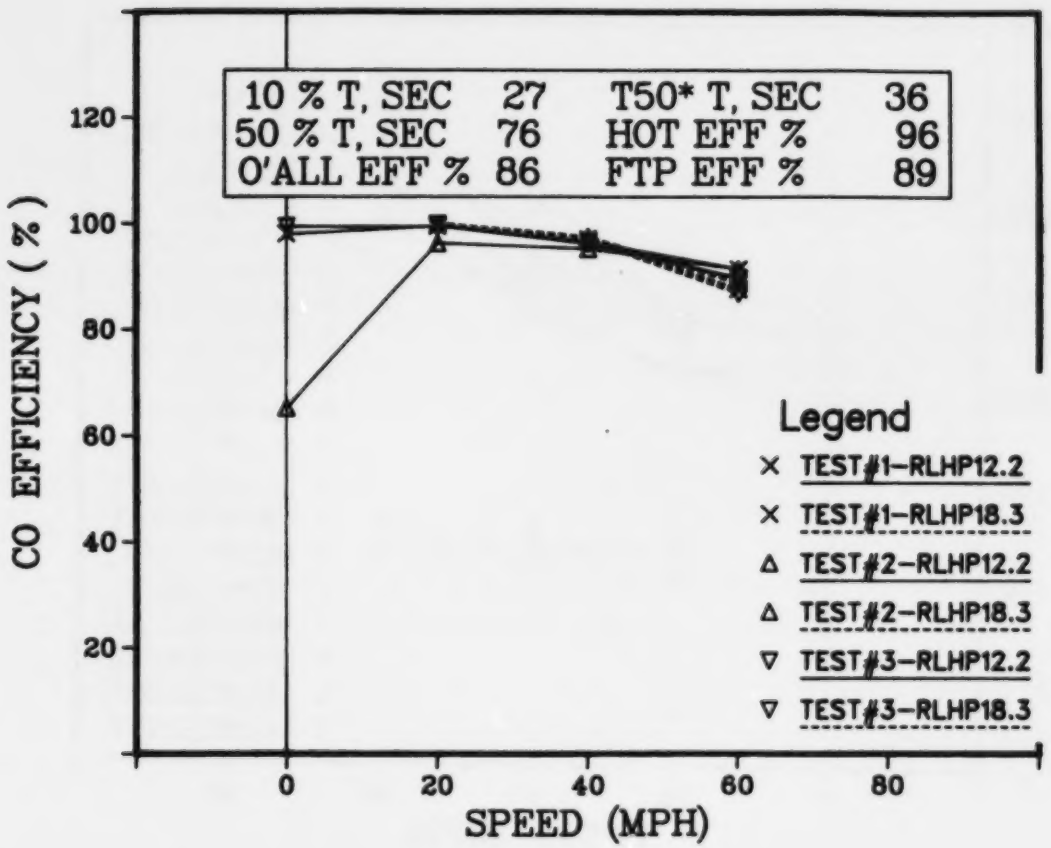

CO EFFICIENCY versus SPEED
CATALYST: #1(1–1) MILES: 0 K
10 % T, SEC 24
50 % T, SEC 50
O'ALL EFF % 94
T50* T, SEC 29
HOT EFF % 100
FTP EFF % 96
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3

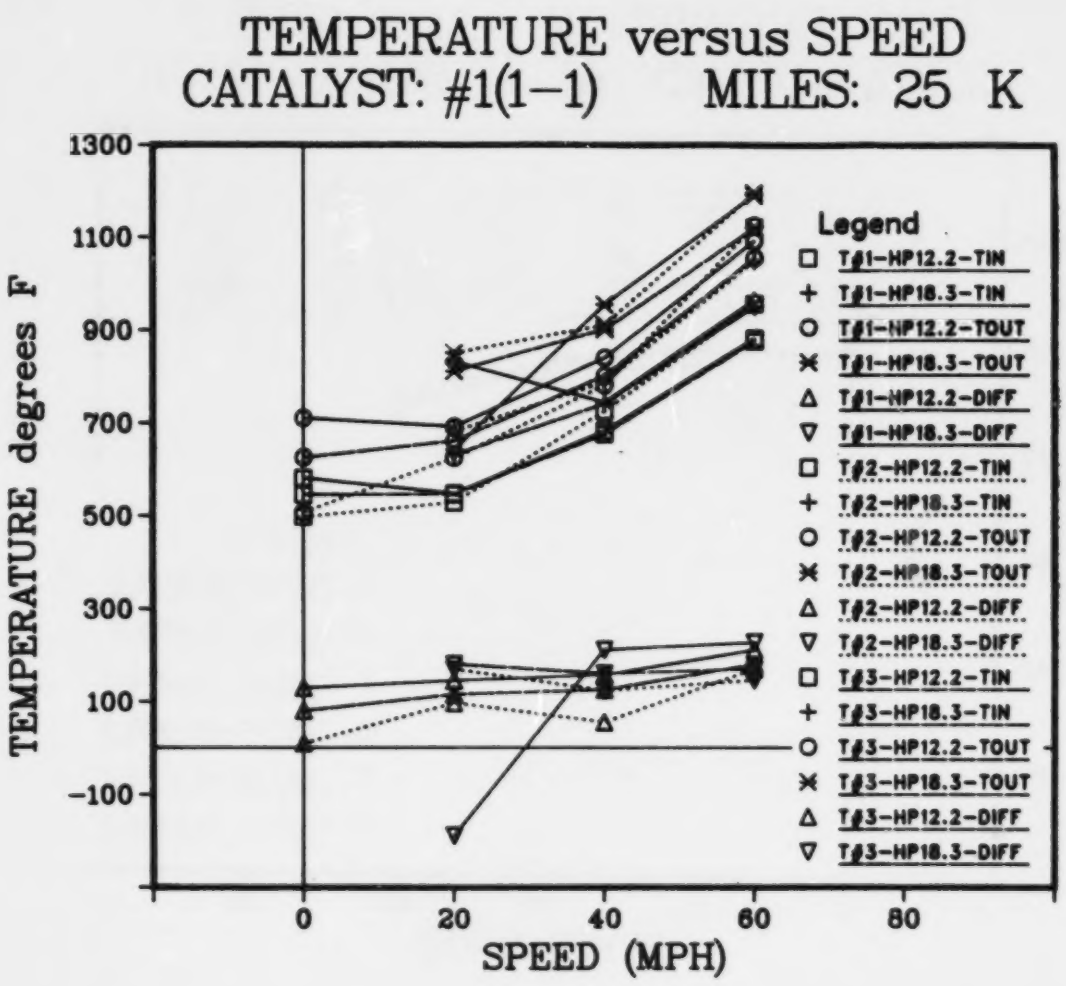

TEMPERATURE versus SPEED
CATALYST: #1(1–1) MILES: 0 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

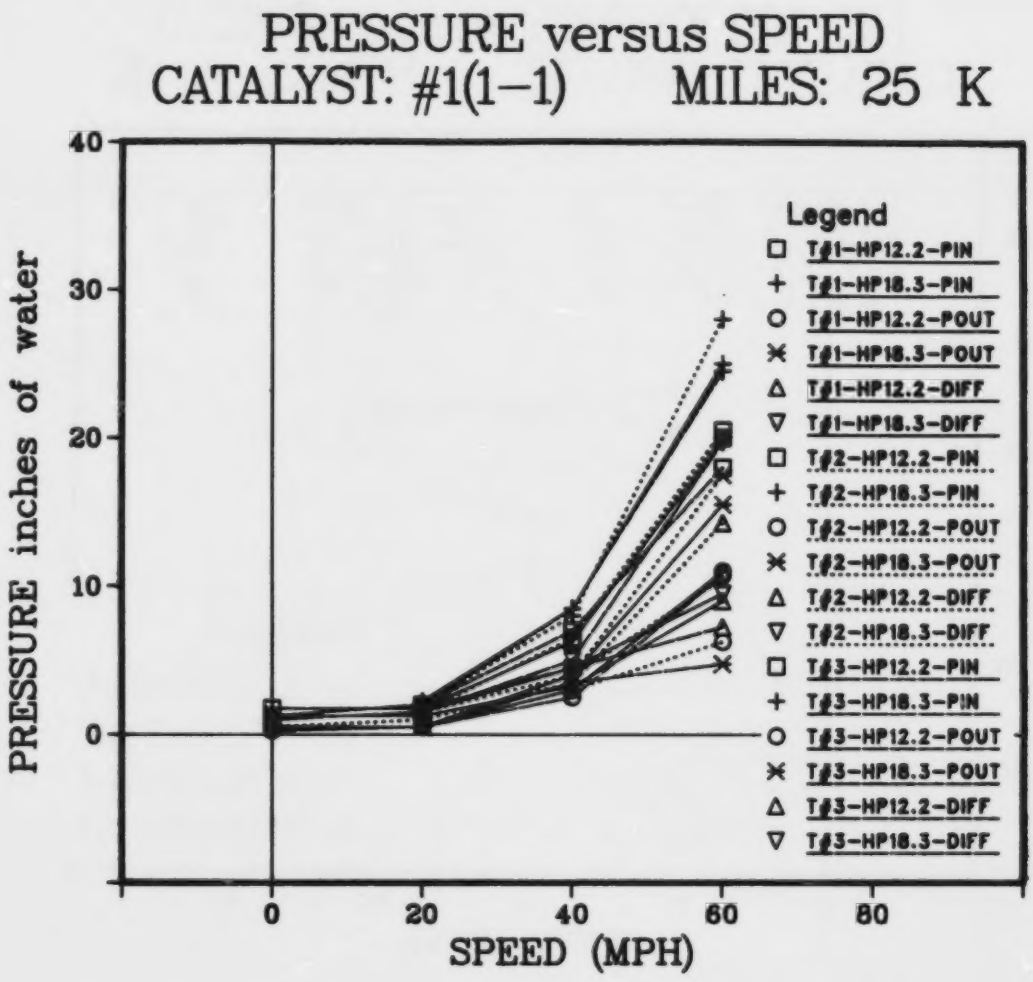

PRESSURE versus SPEED
CATALYST: #1(1–1) MILES: 0 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

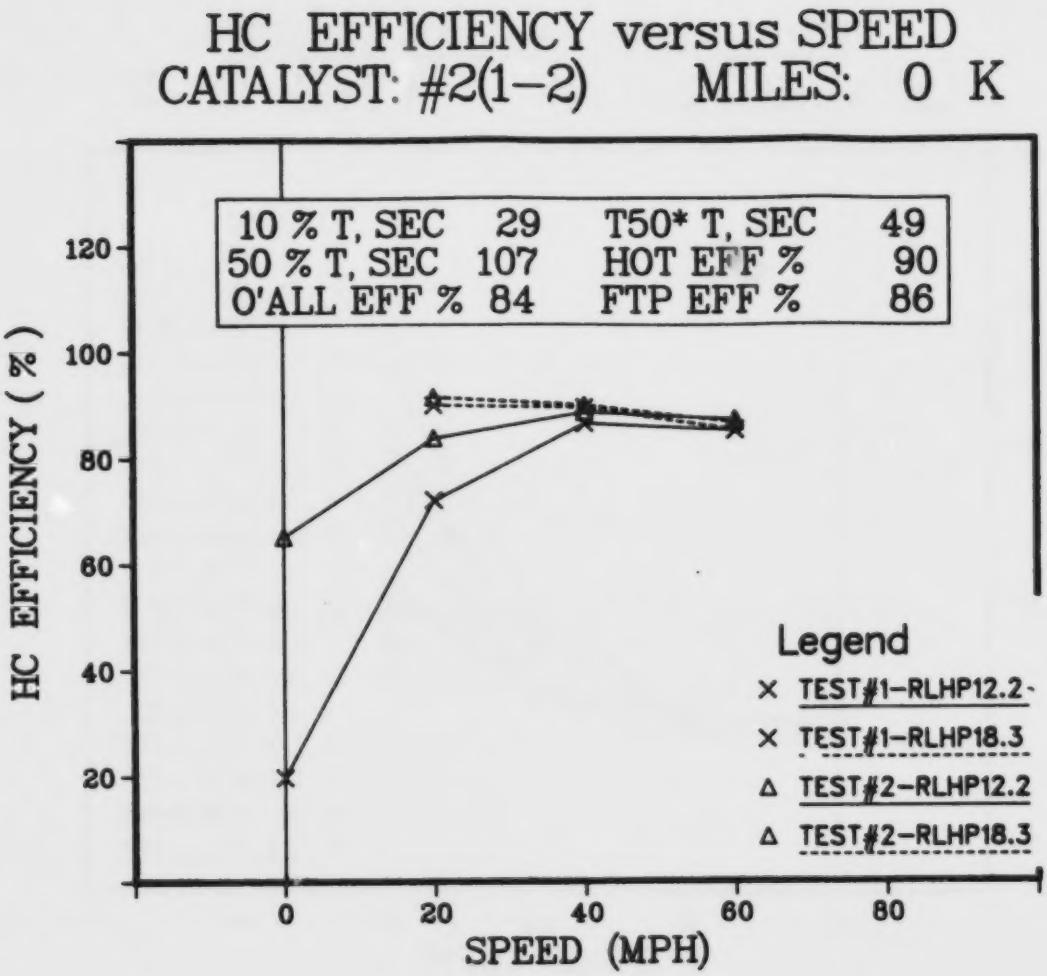

HC EFFICIENCY versus SPEED
CATALYST: #1(1–1) MILES: 25 K
10 % T, SEC 55
T50* T, SEC 95
50 % T, SEC 220
HOT EFF % 74
O'ALL EFF % 67
FTP EFF % 69
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3
TEST#3–RLHP12.2
TEST#3–RLHP18.3

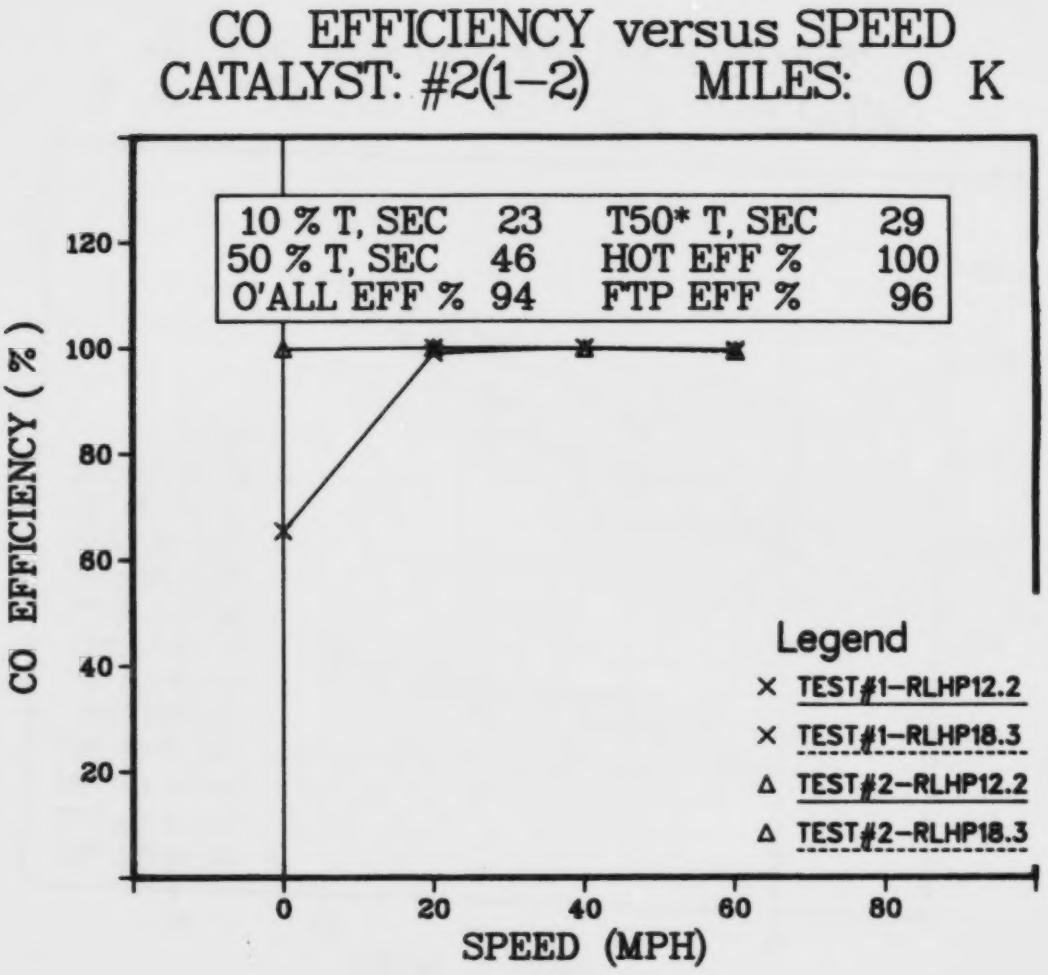
CO EFFICIENCY versus SPEED
CATALYST: #1(1–1) MILES: 25 K



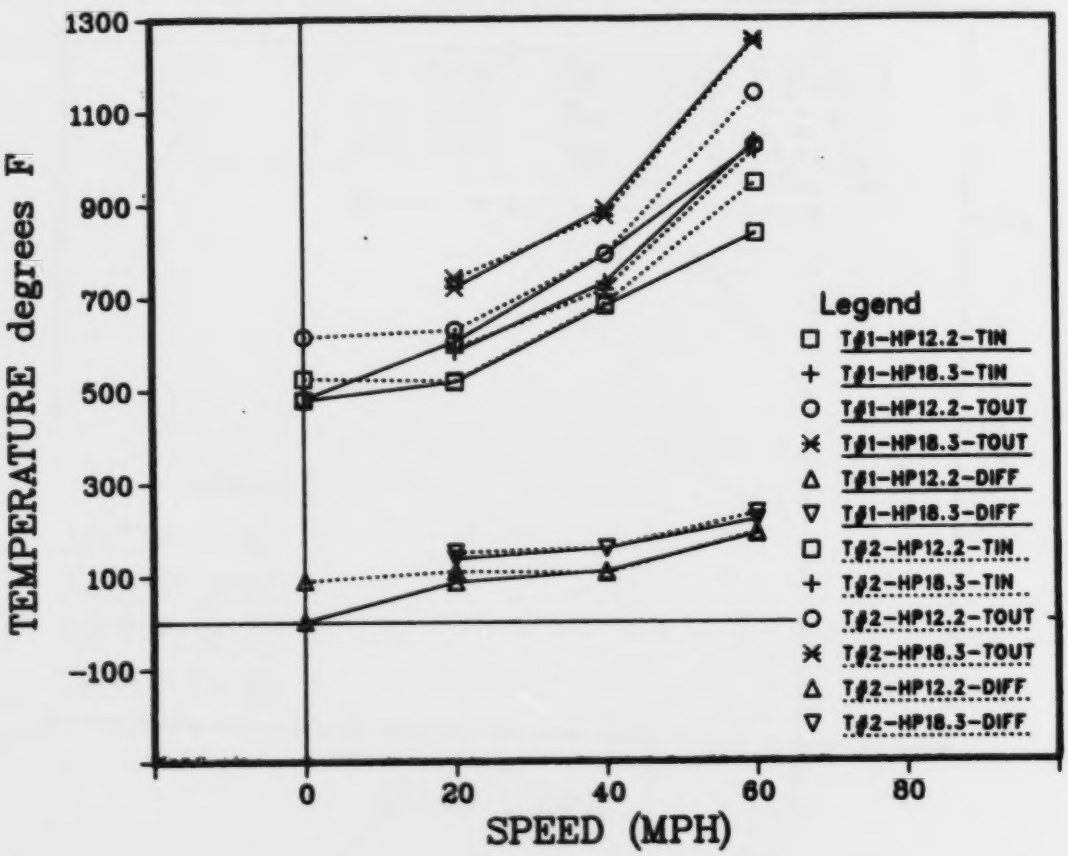

TEMPERATURE versus SPEED
CATALYST: #1(1–1) MILES: 25 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF
T#3-HP12.2-TIN
T#3-HP18.3-TIN
T#3-HP12.2-TOUT
T#3-HP18.3-TOUT
T#3-HP12.2-DIFF
T#3-HP18.3-DIFF

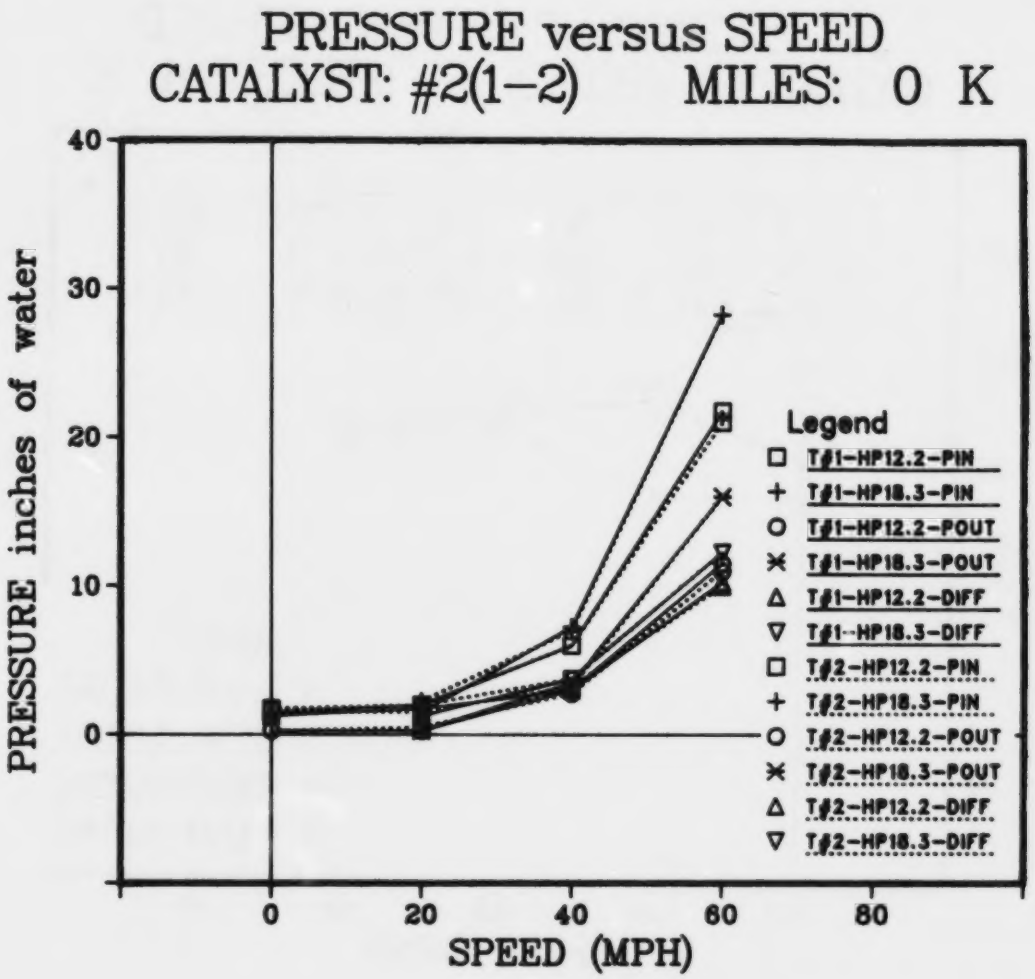

PRESSURE versus SPEED
CATALYST: #1(1-1) MILES: 25 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF
T#3-HP12.2-PIN
T#3-HP18.3-PIN
T#3-HP12.2-POUT
T#3-HP18.3-POUT
T#3-HP12.2-DIFF
T#3-HP18.3-DIFF


HC EFFICIENCY versus SPEED
CATALYST: #2(1-2) MILES: 0 K
10 % T, SEC 29
50 % T, SEC 107
O'ALL EFF % 84
T50* T, SEC 49
HOT EFF % 90
FTP EFF % 86
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1-RLHP12.2
TEST#1-RLHP18.3
TEST#2-RLHP12.2
TEST#2-RLHP18.3

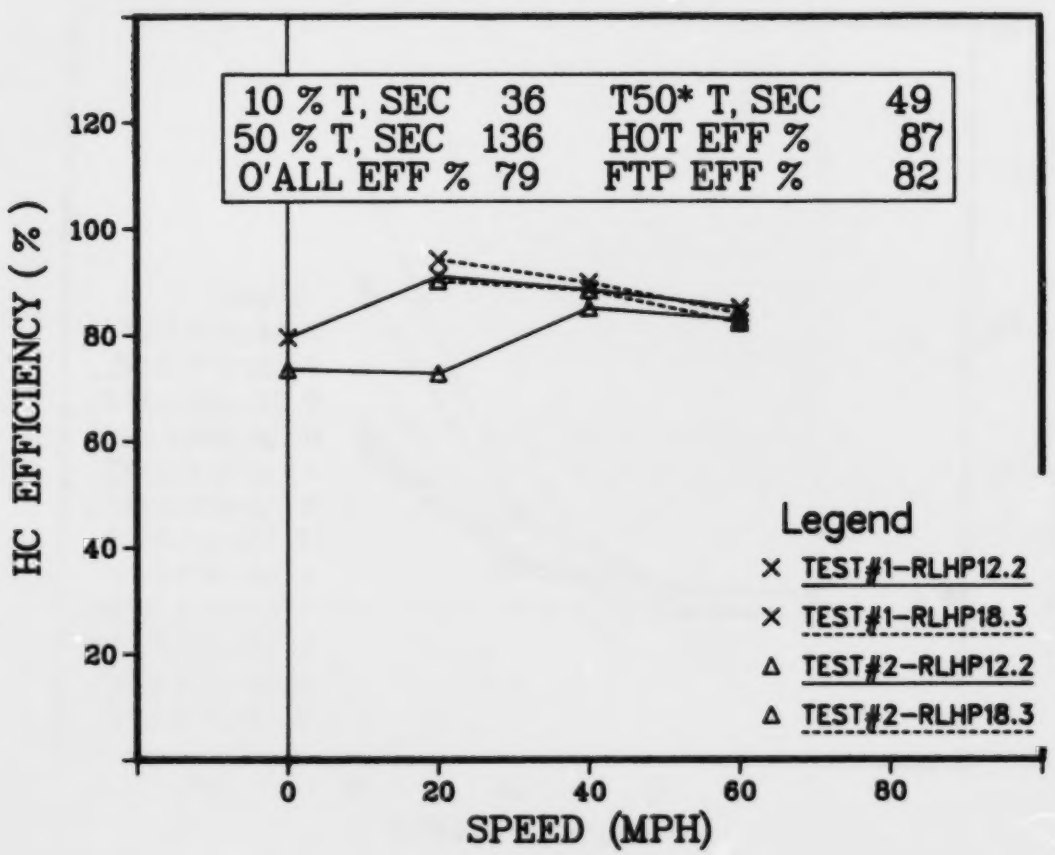

CO EFFICIENCY versus SPEED
CATALYST: #2(1–2) MILES: 0 K
10 % T, SEC 23
50 % T, SEC 46
O'ALL EFF % 94
T50* T, SEC 29
HOT EFF % 100
FTP EFF % 96
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3

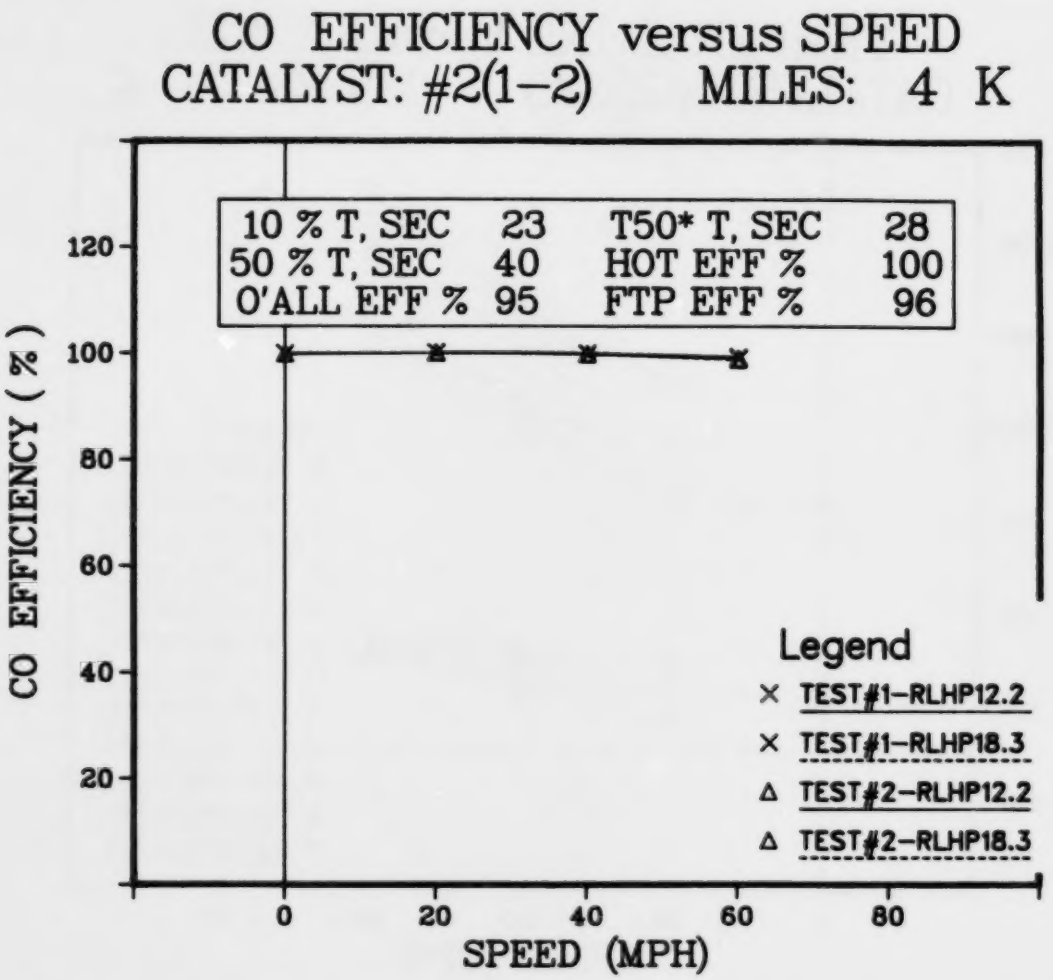
TEMPERATURE versus SPEED
CATALYST: #2(1–2) MILES: 0 K

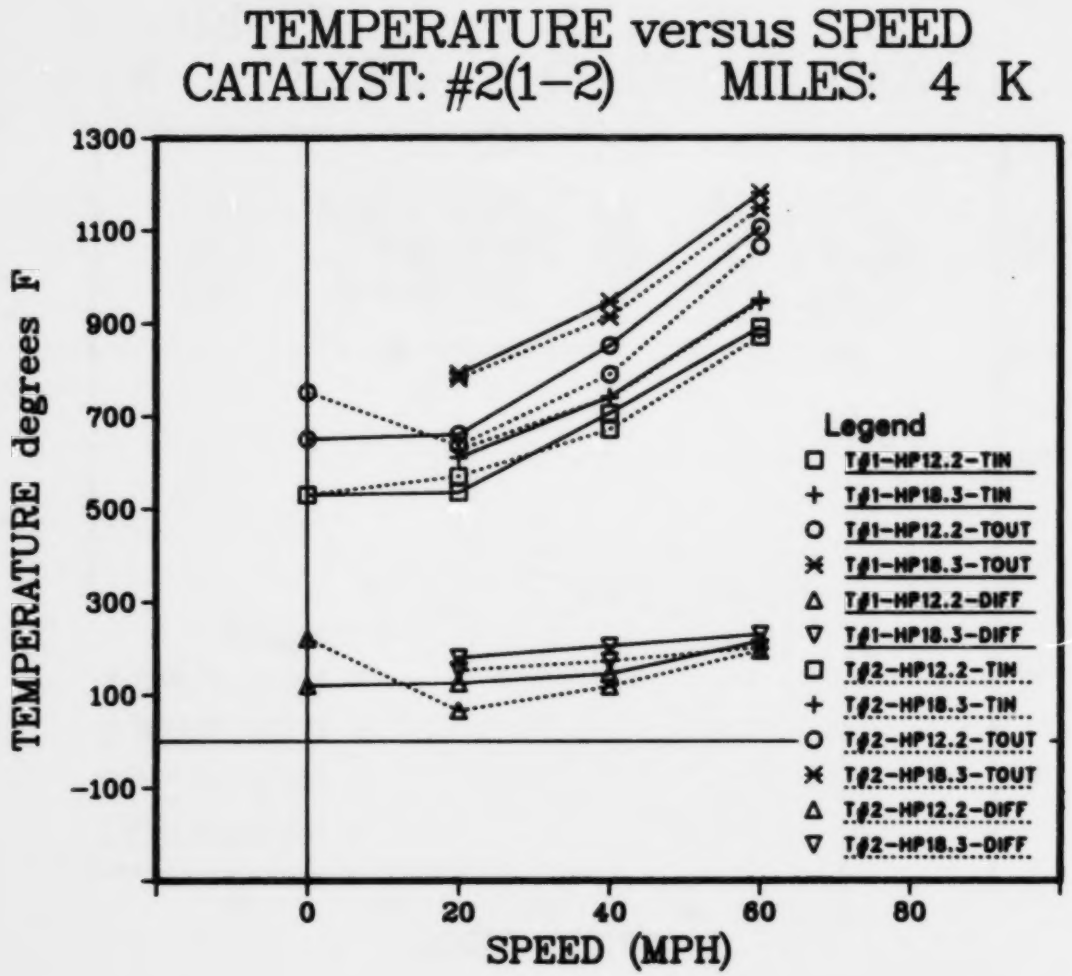


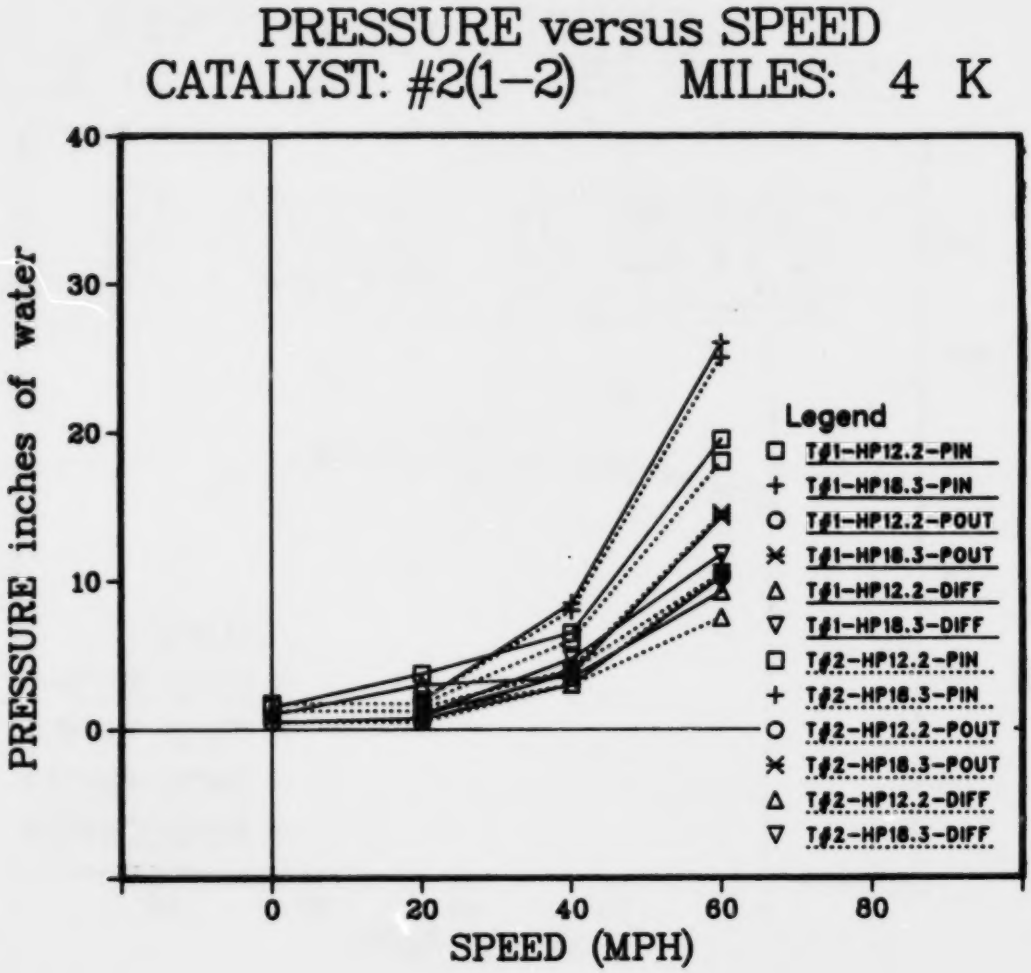

PRESSURE versus SPEED
CATALYST: #2(1–2) MILES: 0 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

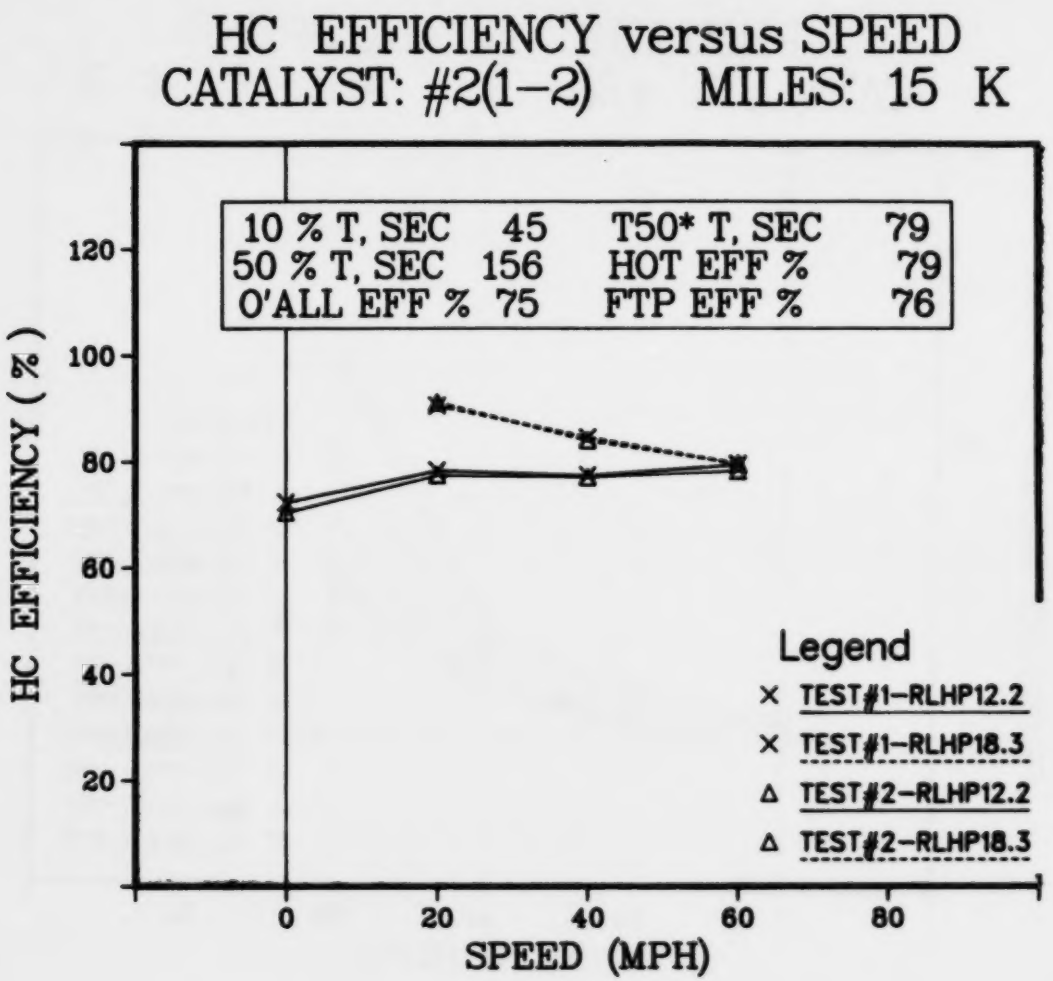
HC EFFICIENCY versus SPEED
CATALYST: #2(1–2) MILES: 4 K



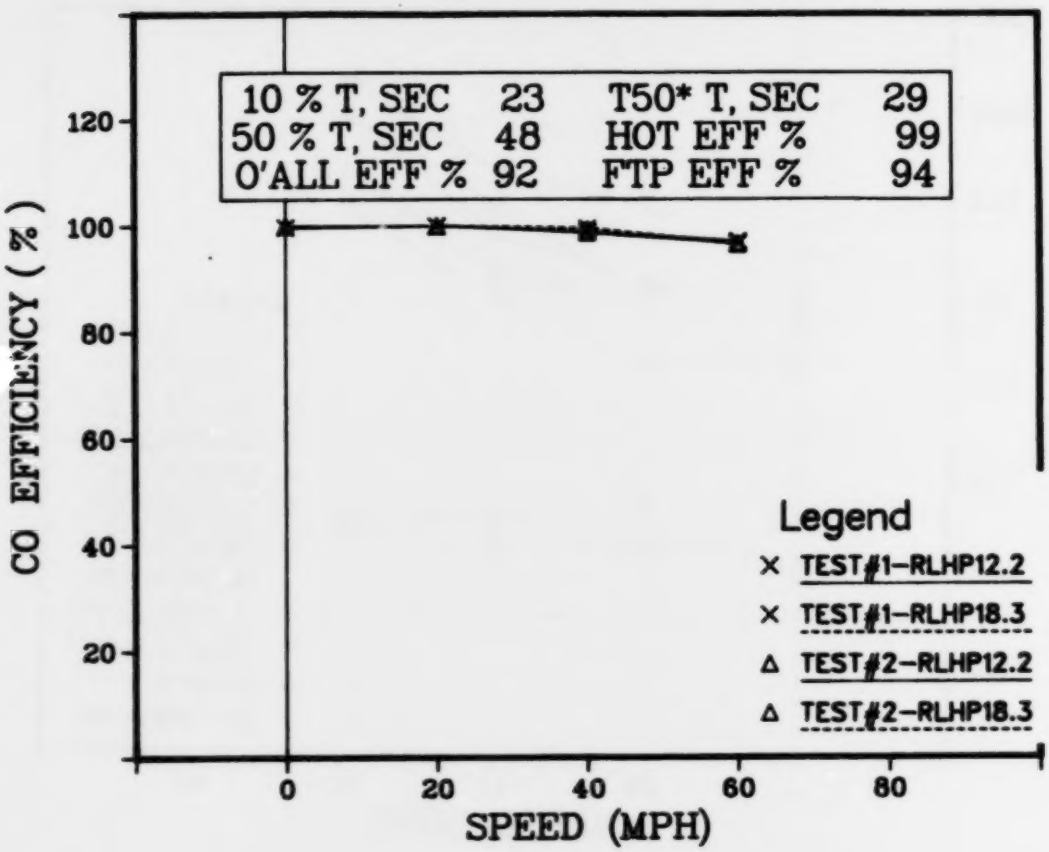

CO EFFICIENCY versus SPEED
CATALYST: #2(1–2) MILES: 4 K
10 % T, SEC 23
50 % T, SEC 40
O'ALL EFF % 95
T50* T, SEC 28
HOT EFF % 100
FTP EFF % 96
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3

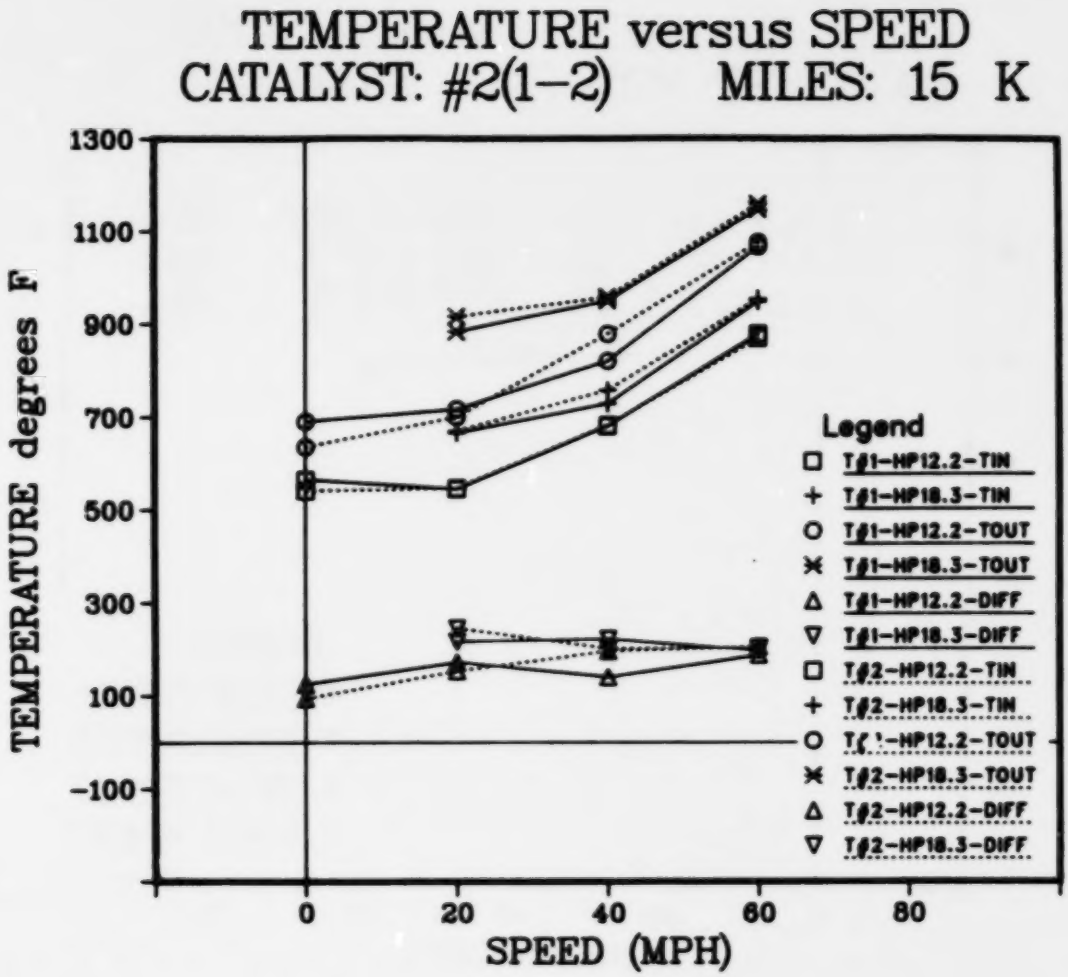

TEMPERATURE versus SPEED
CATALYST: #2(1–2) MILES: 4 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

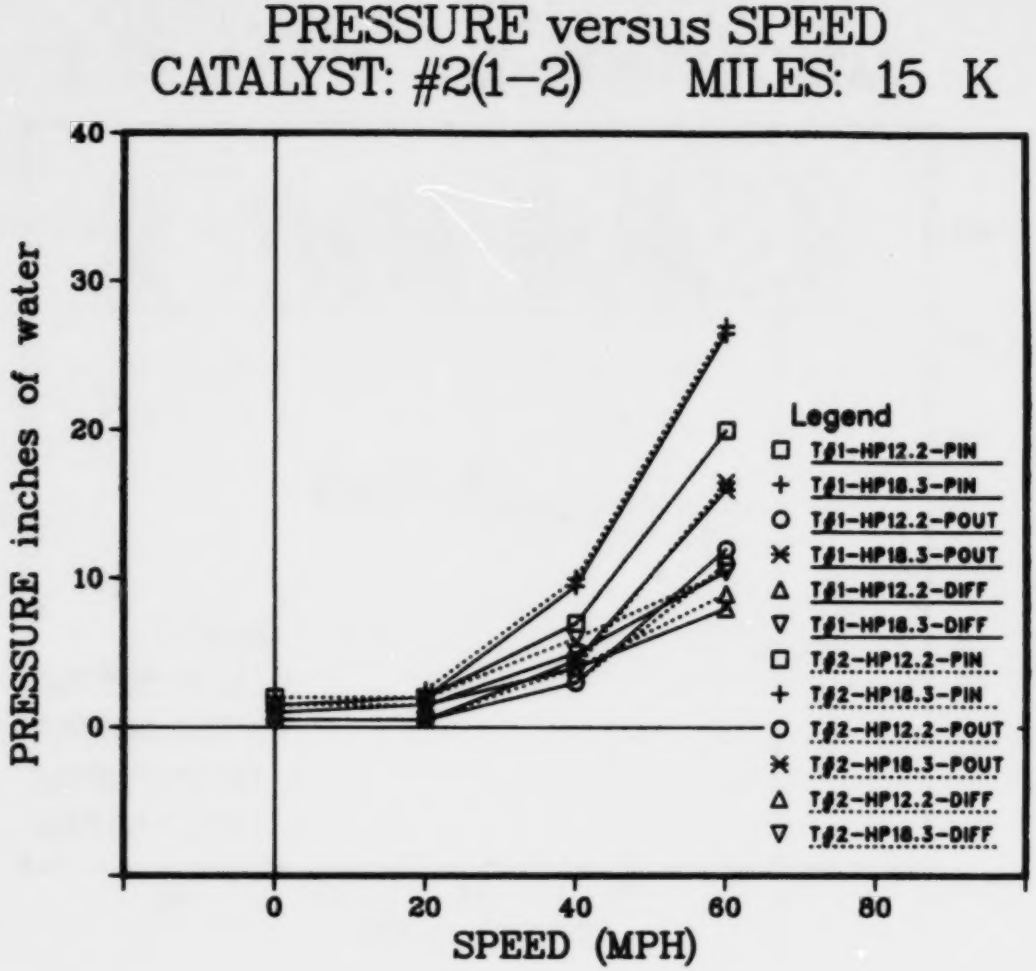

PRESSURE versus SPEED
CATALYST: #2(1–2) MILES: 4 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF


HC EFFICIENCY versus SPEED
CATALYST: #2(1-2) MILES: 15 K
10 % T, SEC 45
50 % T, SEC 156
O'ALL EFF % 75
T50* T, SEC 79
HOT EFF % 79
FTP EFF % 76
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1-RLHP12.2
TEST#1-RLHP18.3
TEST#2-RLHP12.2
TEST#2-RLHP18.3

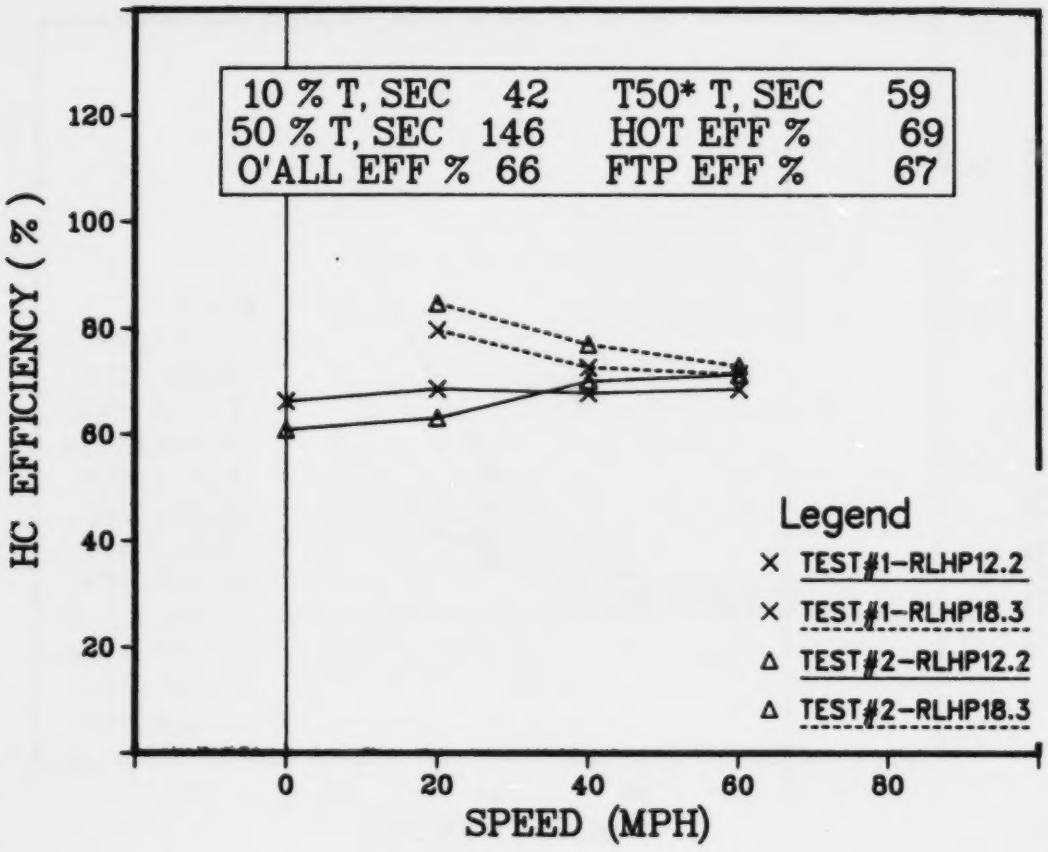
CO EFFICIENCY versus SPEED
CATALYST: #2(1–2) MILES: 15 K

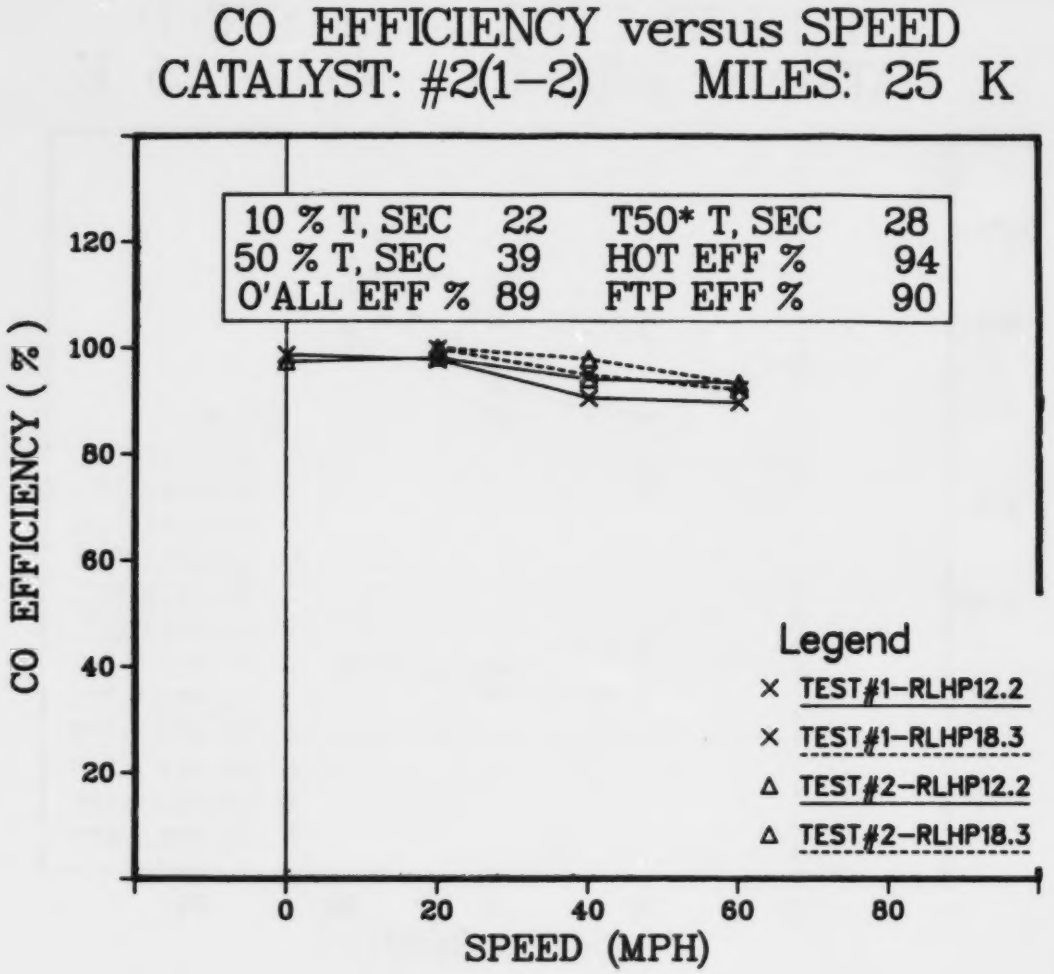


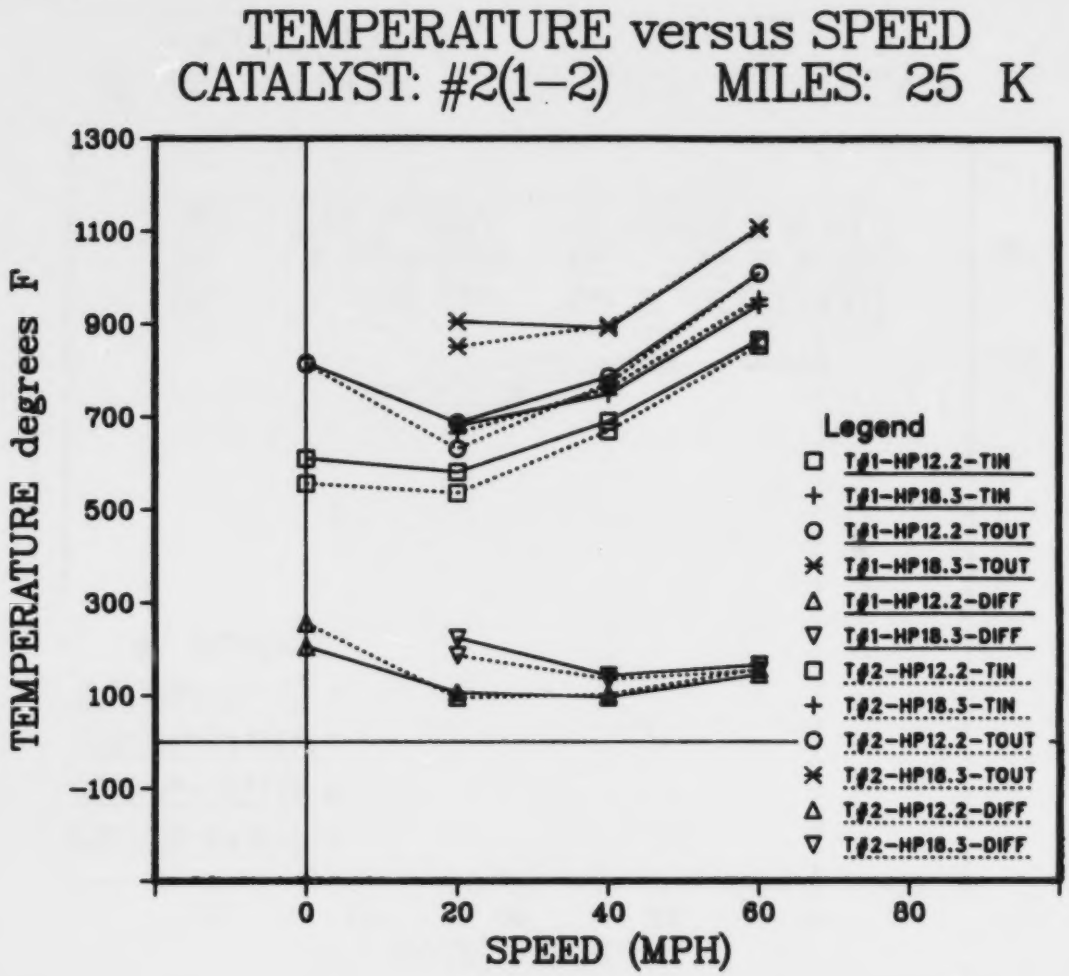

TEMPERATURE versus SPEED
CATALYST: #2(1–2) MILES: 15 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

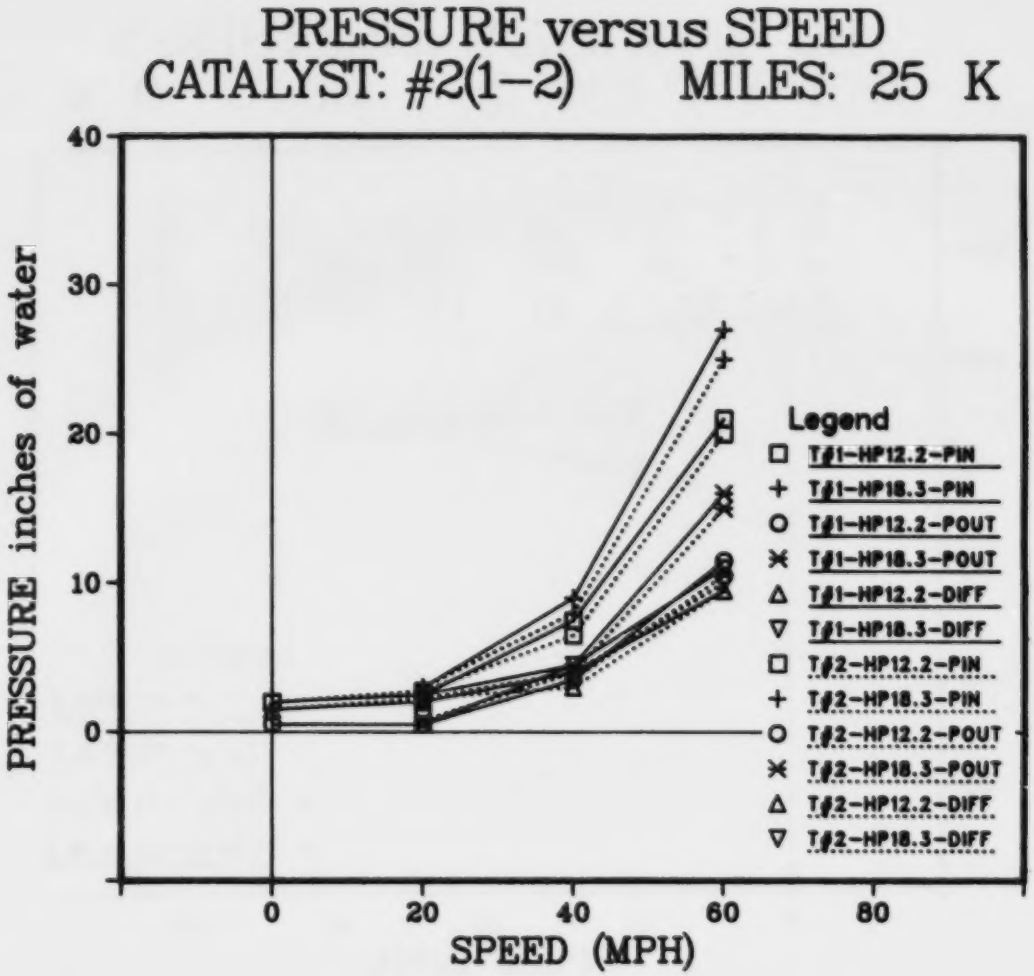

PRESSURE versus SPEED
CATALYST: #2(1–2) MILES: 15 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T@1-HP12.2-PIN
T@1-HP18.3-PIN
T@1-HP12.2-POUT
T@1-HP18.3-POUT
T@1-HP12.2-DIFF
T@1-HP18.3-DIFF
T@2-HP12.2-PIN
T@2-HP18.3-PIN
T@2-HP12.2-POUT
T@2-HP18.3-POUT
T@2-HP12.2-DIFF
T@2-HP18.3-DIFF

HC EFFICIENCY versus SPEED
CATALYST: #2(1–2) MILES: 25 K

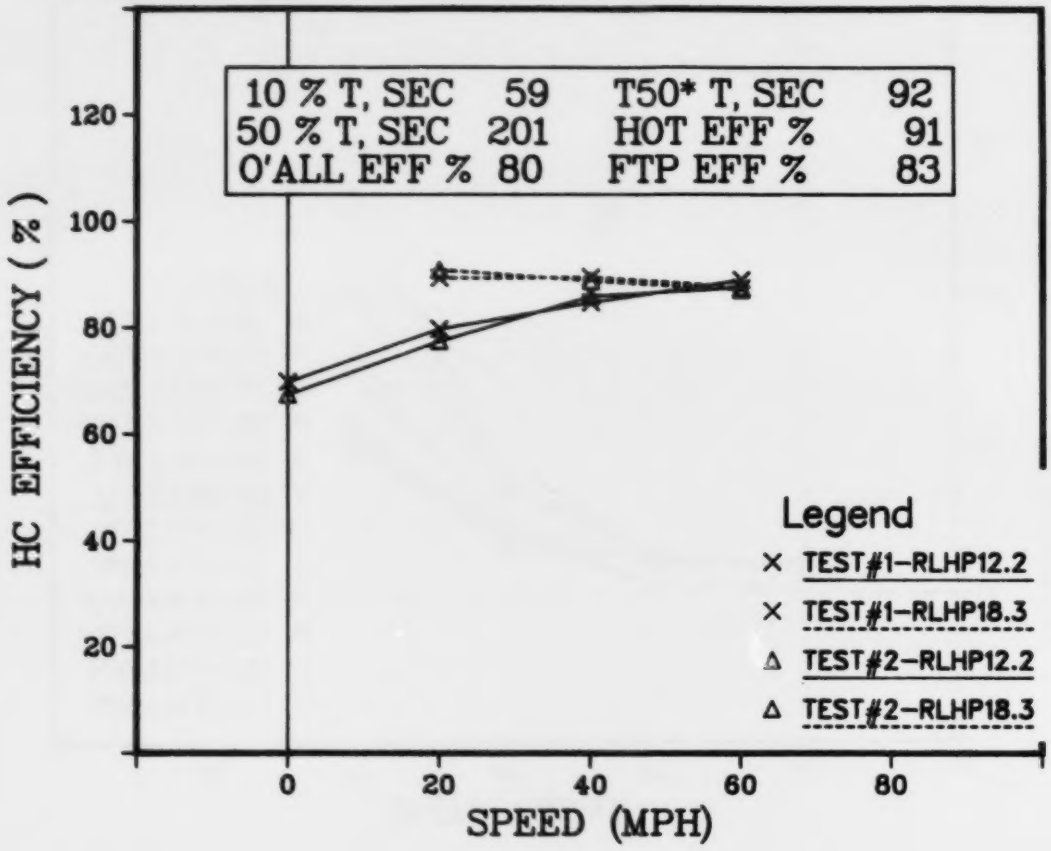


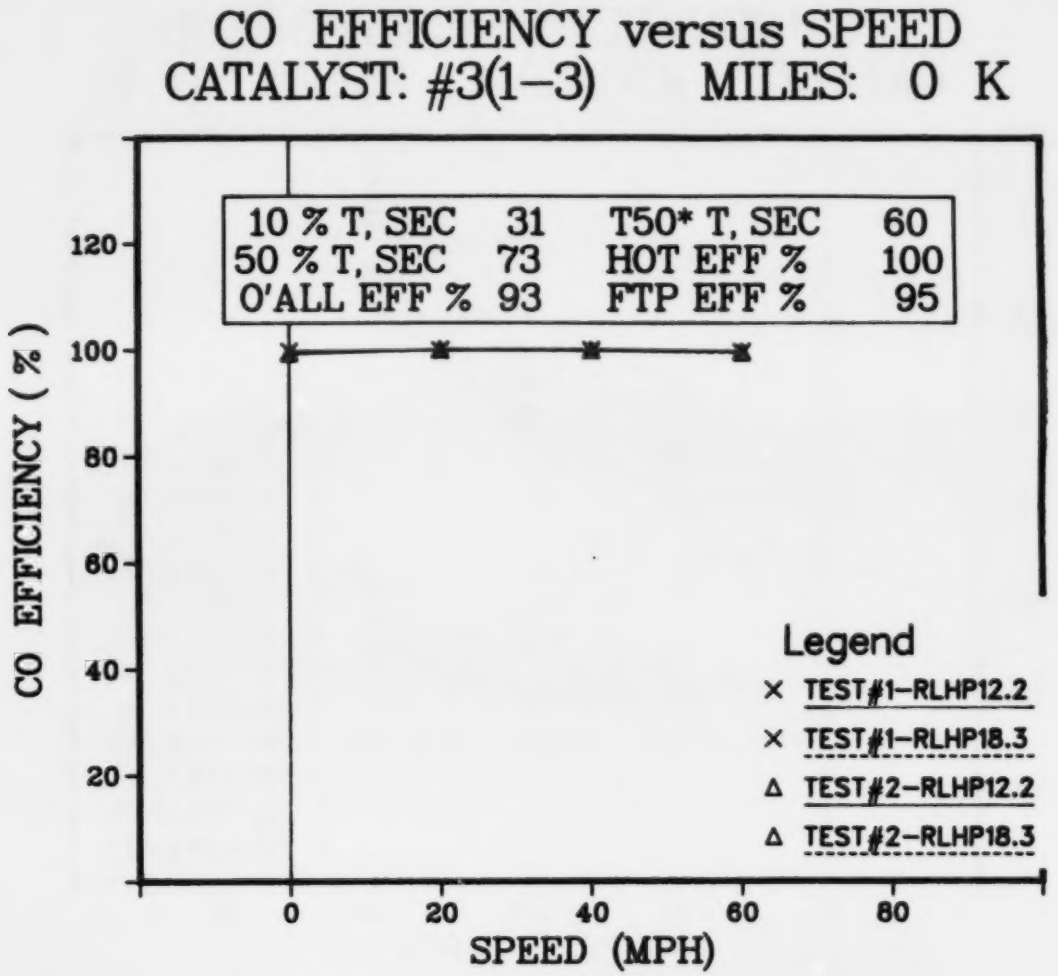

CO EFFICIENCY versus SPEED
CATALYST: #2(1-2) MILES: 25 K
10 % T, SEC 22
50 % T, SEC 39
O'ALL EFF % 89
T50* T, SEC 28
HOT EFF % 94
FTP EFF % 90
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1-RLHP12.2
TEST#1-RLHP18.3
TEST#2-RLHP12.2
TEST#2-RLHP18.3

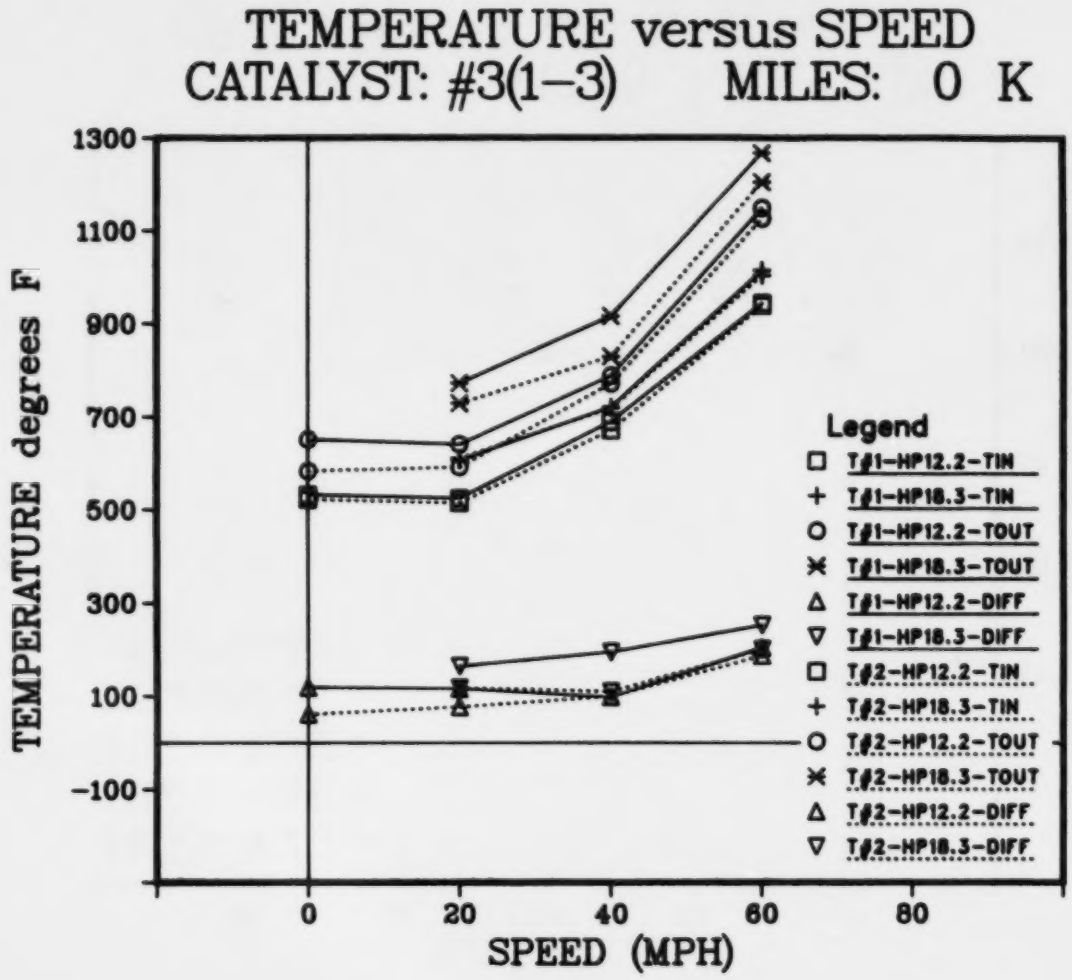

TEMPERATURE versus SPEED
CATALYST: #2(1–2) MILES: 25 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

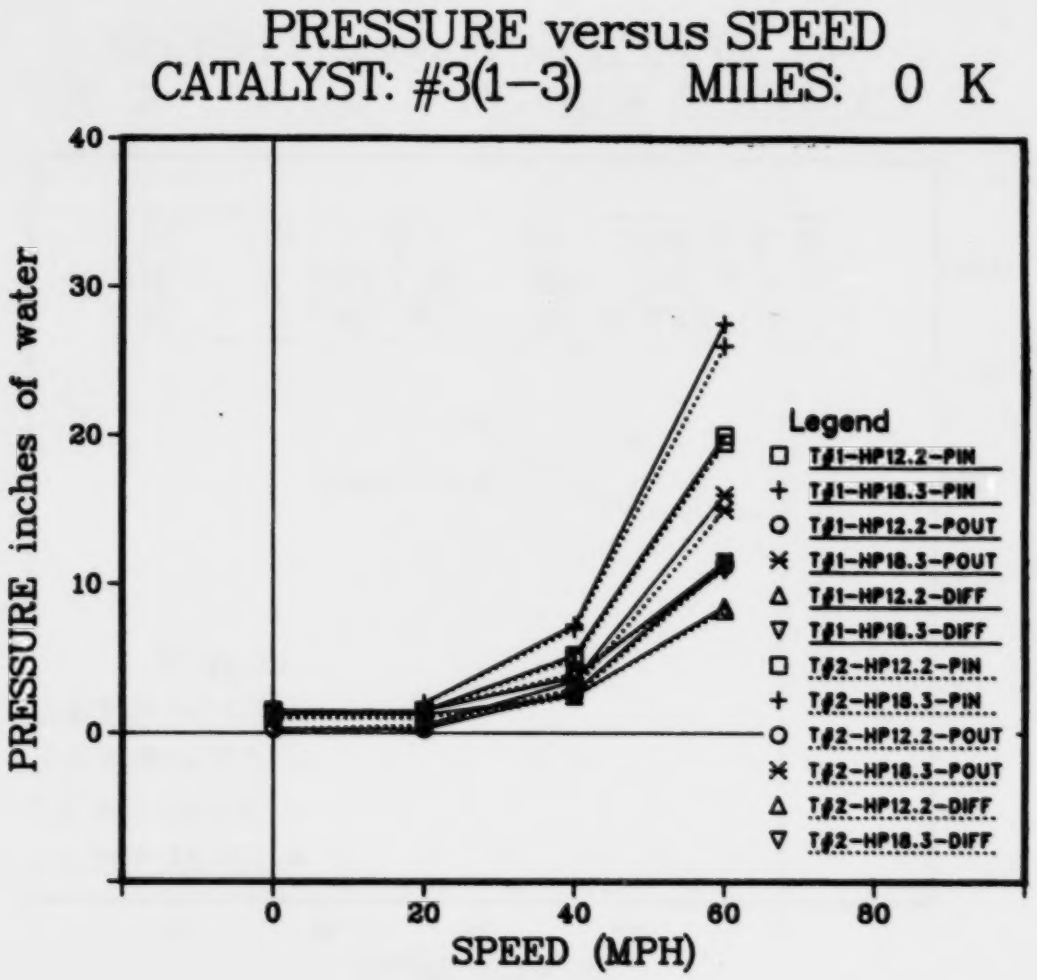

PRESSURE versus SPEED
CATALYST: #2(1–2) MILES: 25 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

HC EFFICIENCY versus SPEED
CATALYST: #3(1–3) MILES: 0 K

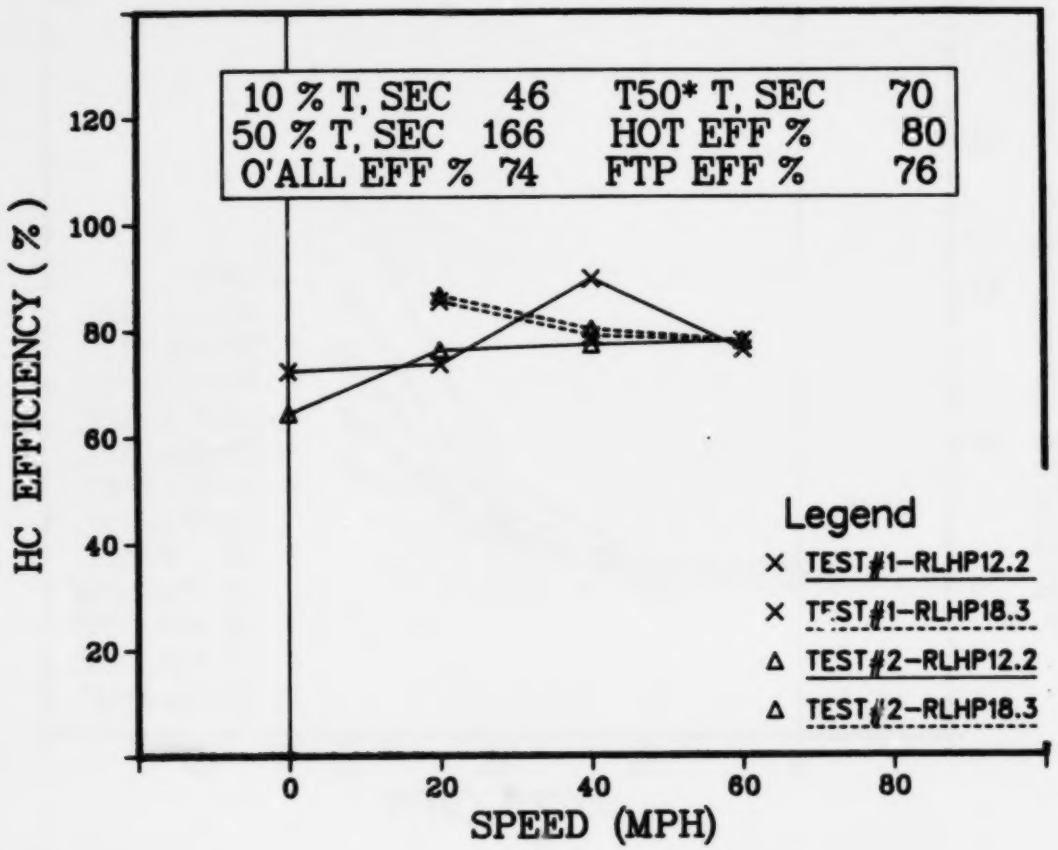


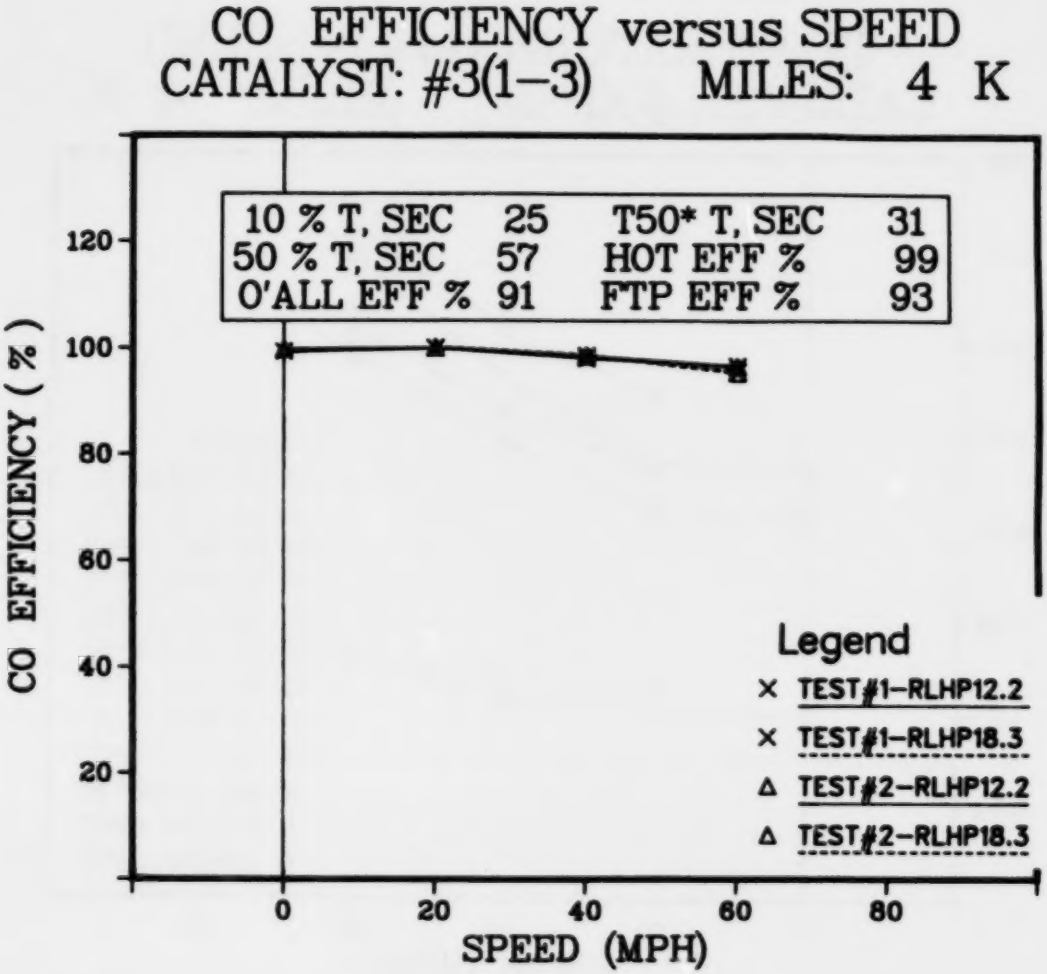

CO EFFICIENCY versus SPEED
CATALYST: #3(1–3) MILES: 0 K
10 % T, SEC 31
50 % T, SEC 73
O'ALL EFF % 93
T50* T, SEC 60
HOT EFF % 100
FTP EFF % 95
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3


TEMPERATURE versus SPEED
CATALYST: #3(1–3) MILES: 0 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

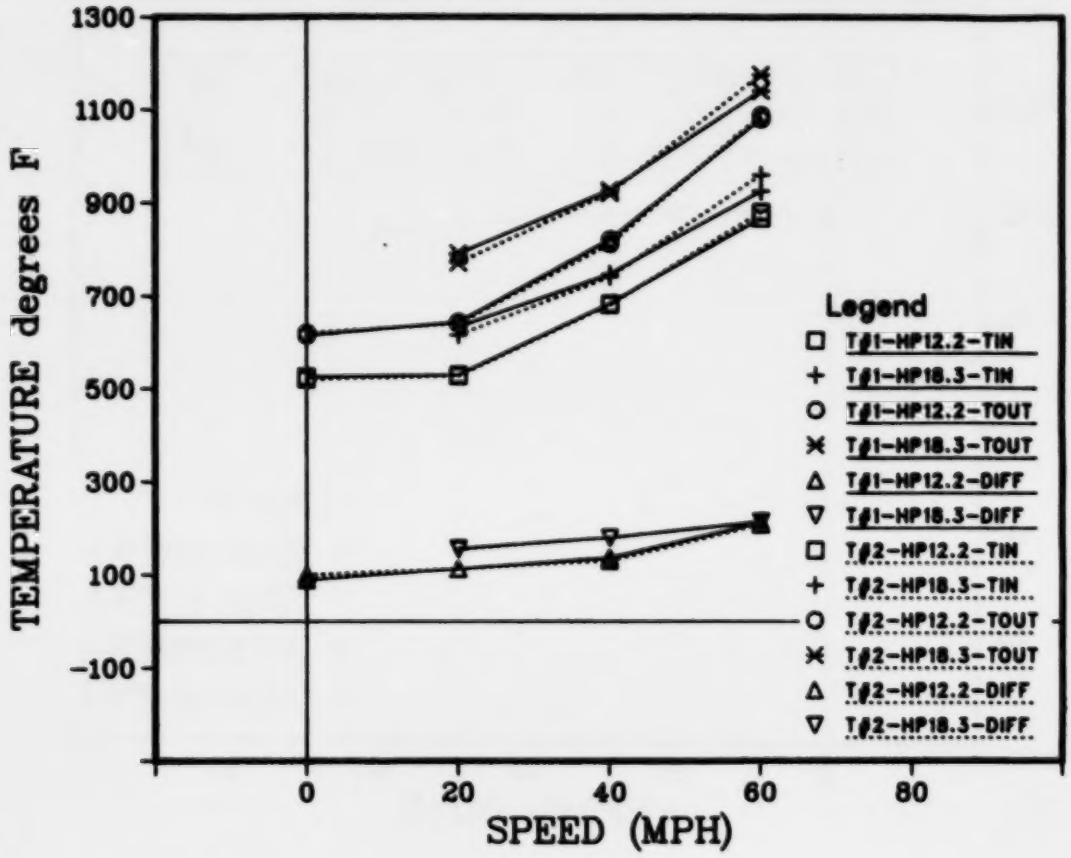

PRESSURE versus SPEED
CATALYST: #3(1–3) MILES: 0 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1–HP12.2–PIN
T#1–HP18.3–PIN
T#1–HP12.2–POUT
T#1–HP18.3–POUT
T#1–HP12.2–DIFF
T#1–HP18.3–DIFF
T#2–HP12.2–PIN
T#2–HP18.3–PIN
T#2–HP12.2–POUT
T#2–HP18.3–POUT
T#2–HP12.2–DIFF
T#2–HP18.3–DIFF

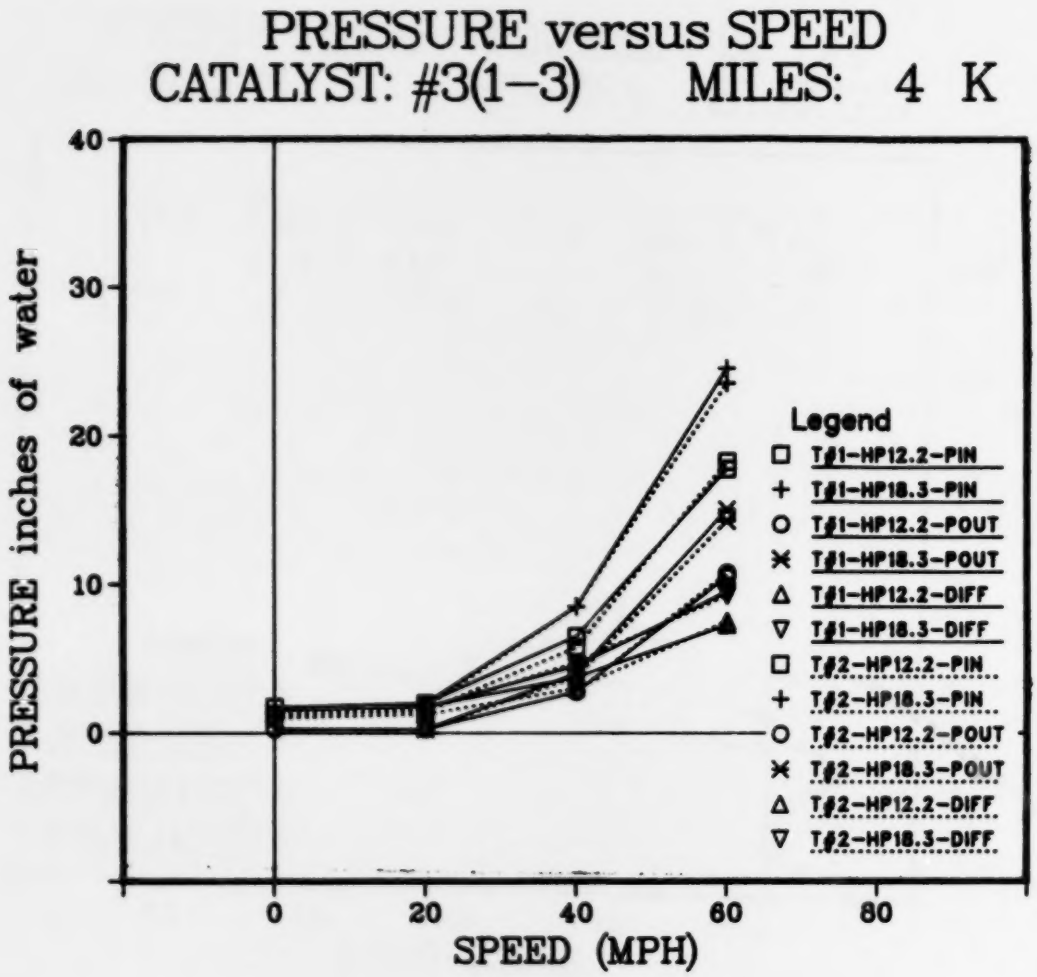
HC EFFICIENCY versus SPEED
CATALYST: #3(1–3) MILES: 4 K



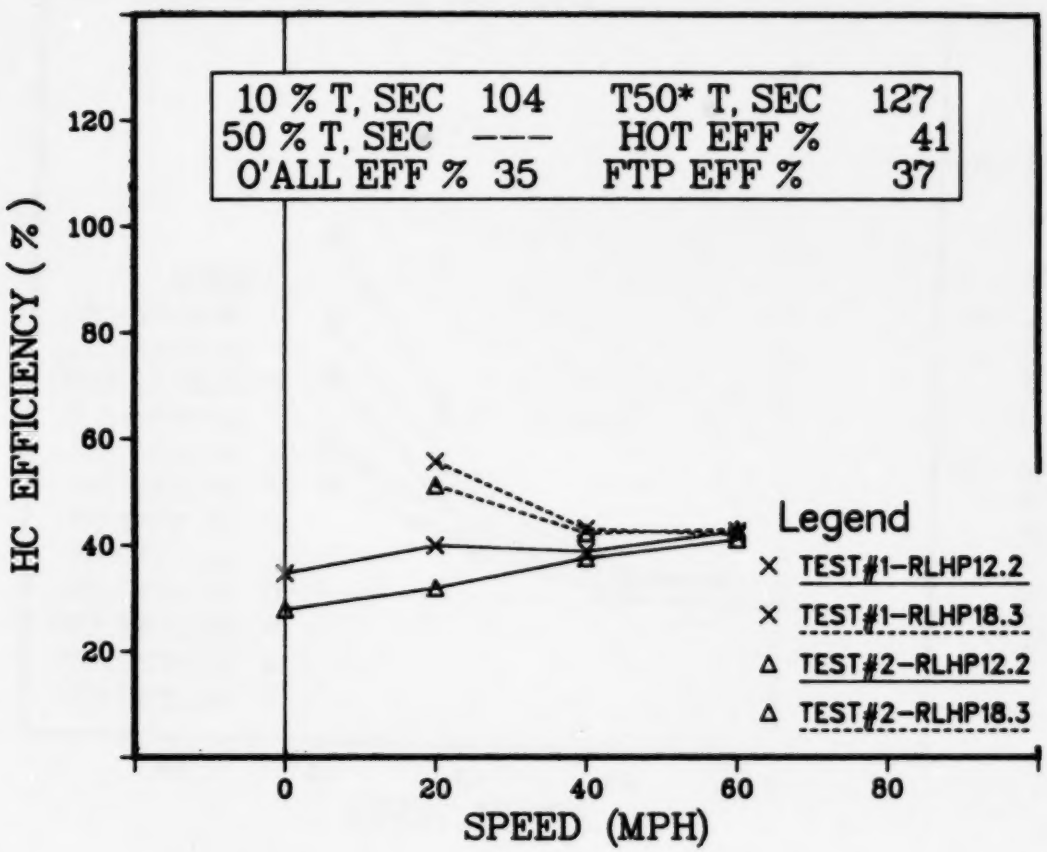

CO EFFICIENCY versus SPEED
CATALYST: #3(1–3) MILES: 4 K
10 % T, SEC 25
50 % T, SEC 57
O'ALL EFF % 91
T50* T, SEC 31
HOT EFF % 99
FTP EFF % 93
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3

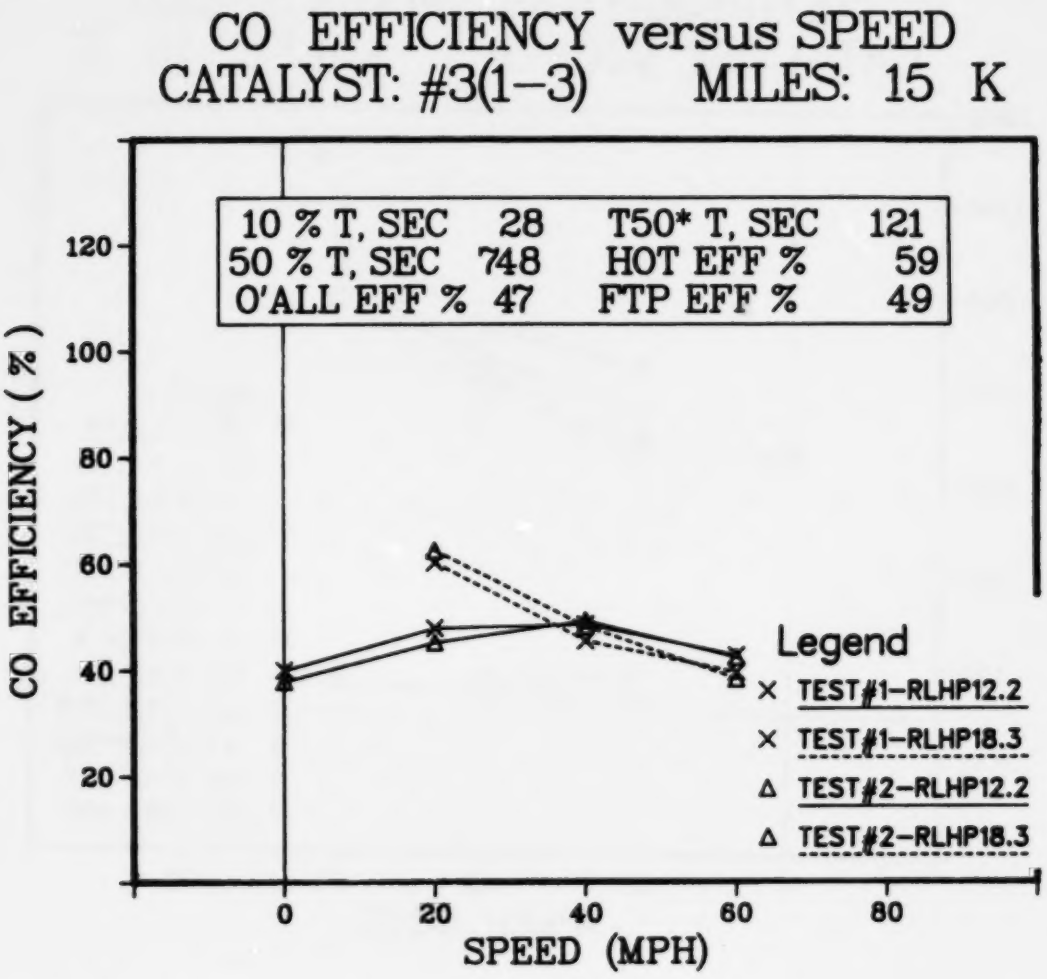
TEMPERATURE versus SPEED
CATALYST: #3(1–3) MILES: 4 K

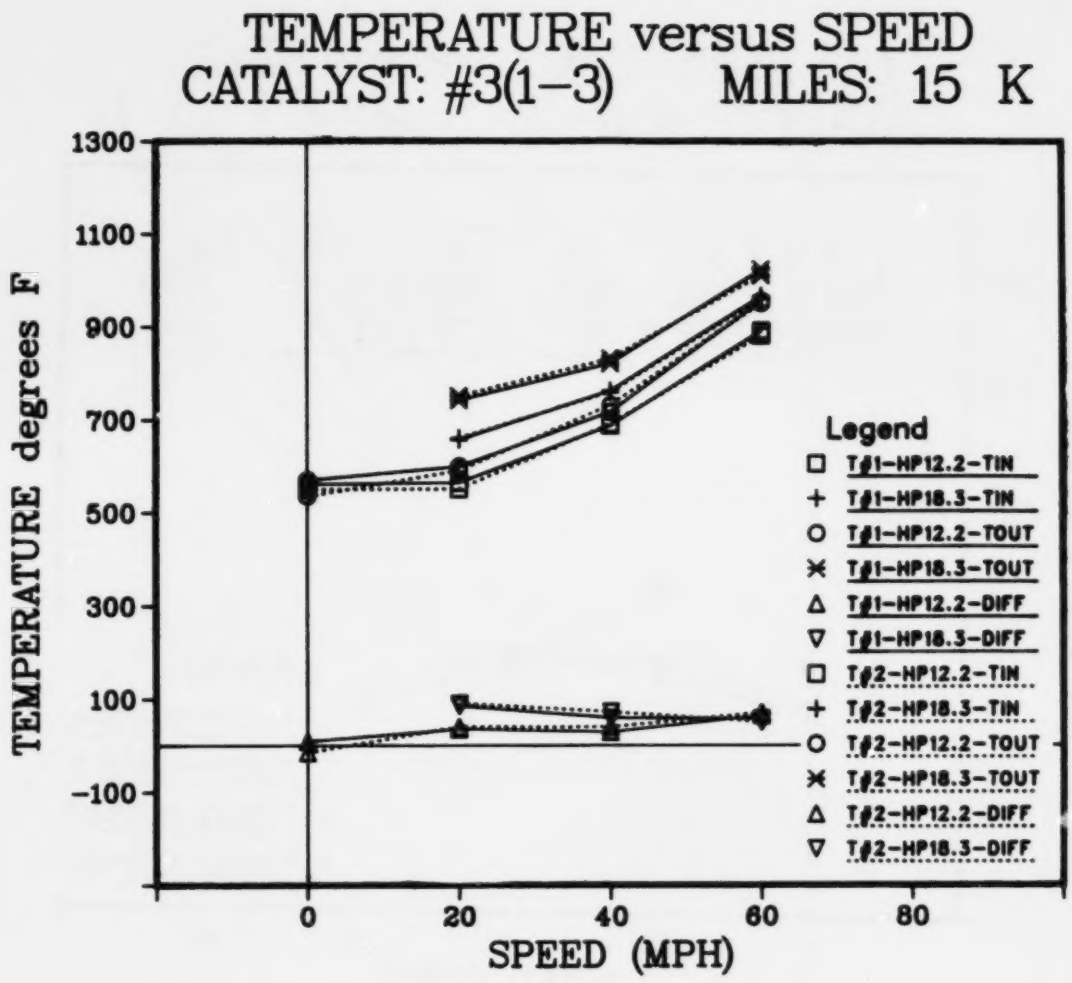


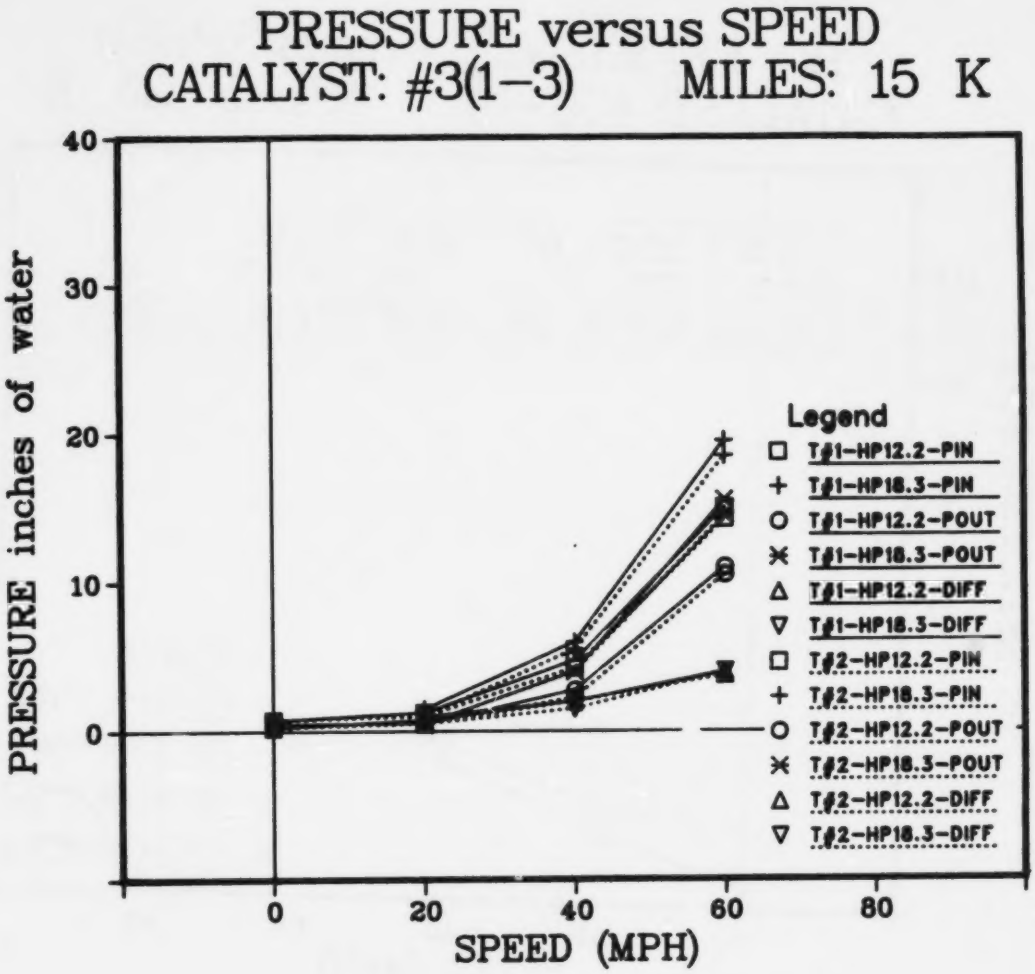

PRESSURE versus SPEED
CATALYST: #3(1–3) MILES: 4 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

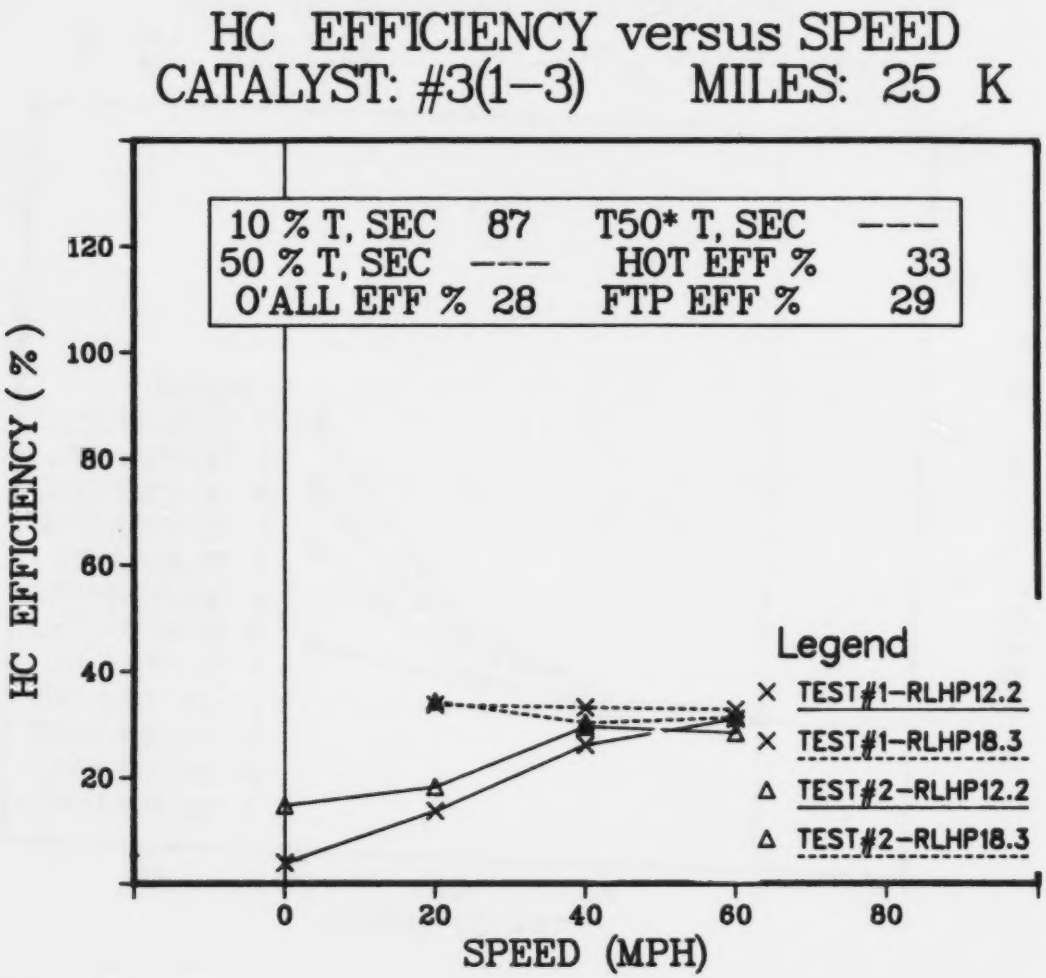
HC EFFICIENCY versus SPEED
CATALYST: #3(1–3) MILES: 15 K



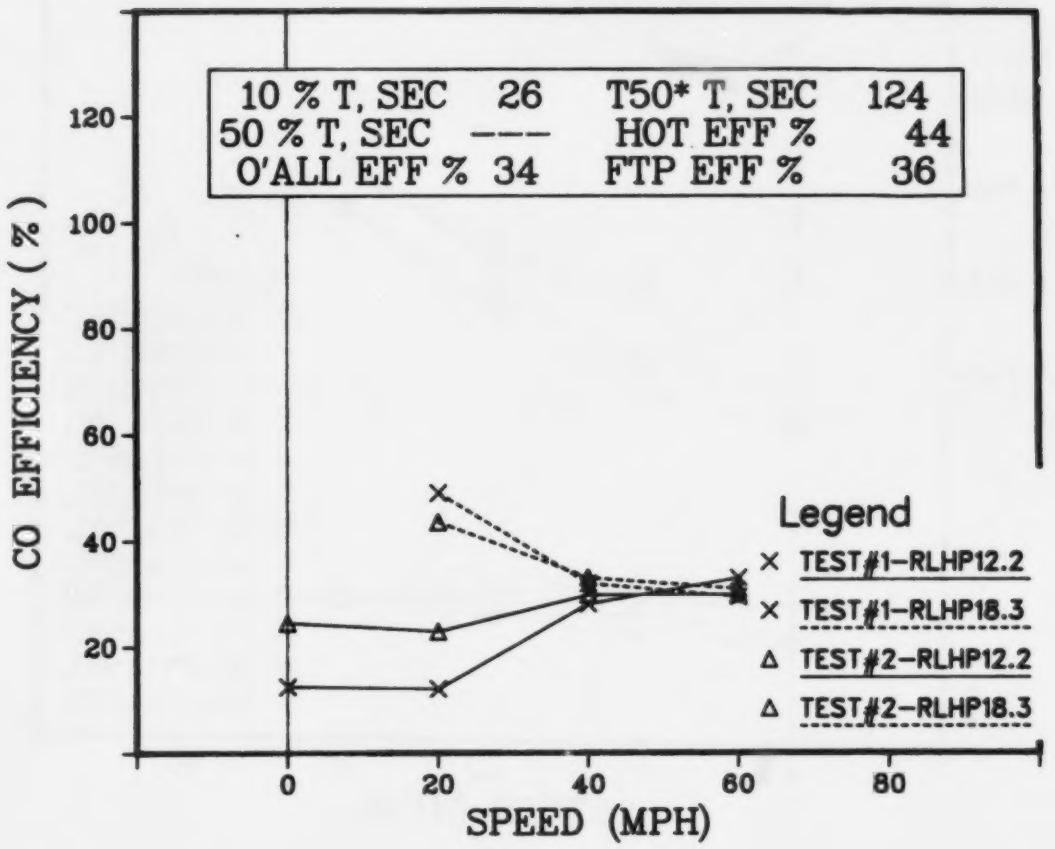

CO EFFICIENCY versus SPEED
CATALYST: #3(1-3) MILES: 15 K
10 % T, SEC 28
50 % T, SEC 748
O'ALL EFF % 47
T50* T, SEC 121
HOT EFF % 59
FTP EFF % 49
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1-RLHP12.2
TEST#1-RLHP18.3
TEST#2-RLHP12.2
TEST#2-RLHP18.3

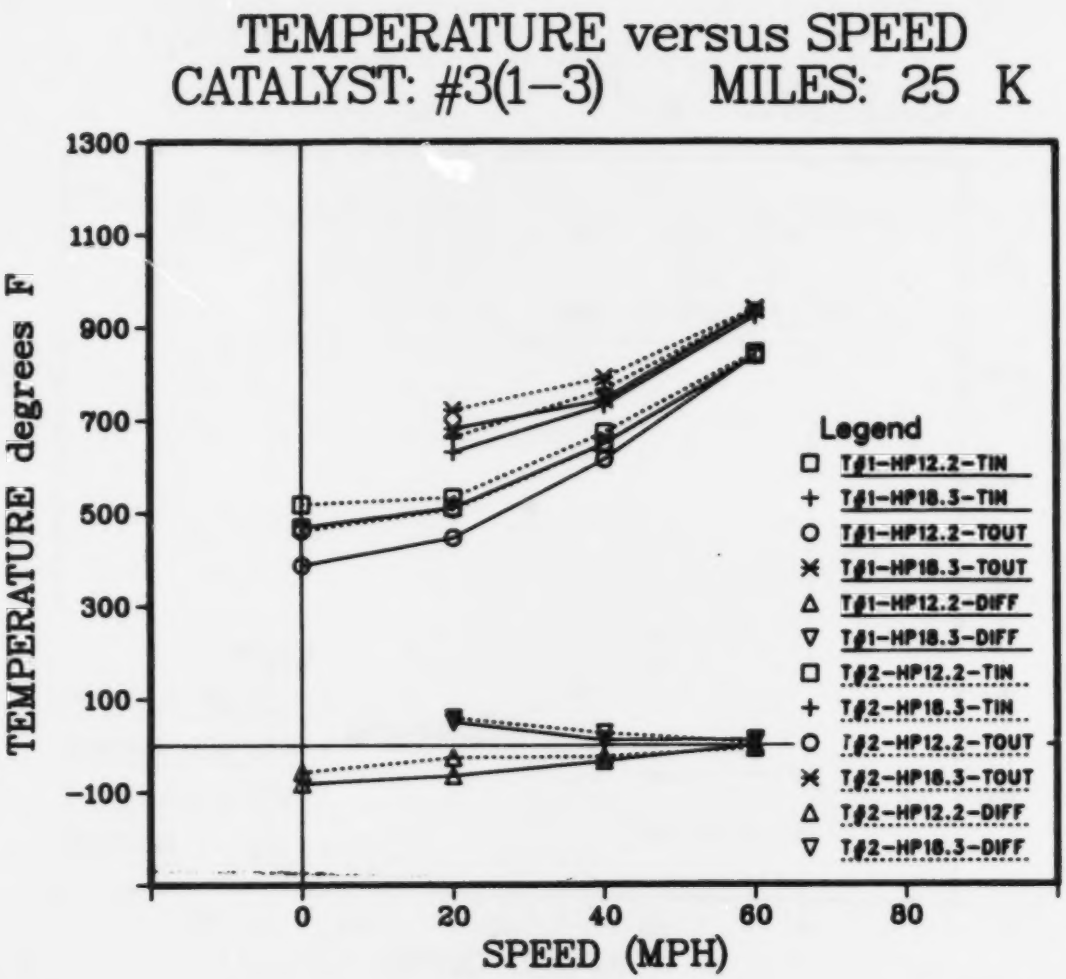

TEMPERATURE versus SPEED
CATALYST: #3(1–3) MILES: 15 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T∅1-HP12.2-TIN
T∅1-HP18.3-TIN
T∅1-HP12.2-TOUT
T∅1-HP18.3-TOUT
T∅1-HP12.2-DIFF
T∅1-HP18.3-DIFF
T∅2-HP12.2-TIN
T∅2-HP18.3-TIN
T∅2-HP12.2-TOUT
T∅2-HP18.3-TOUT
T∅2-HP12.2-DIFF
T∅2-HP18.3-DIFF

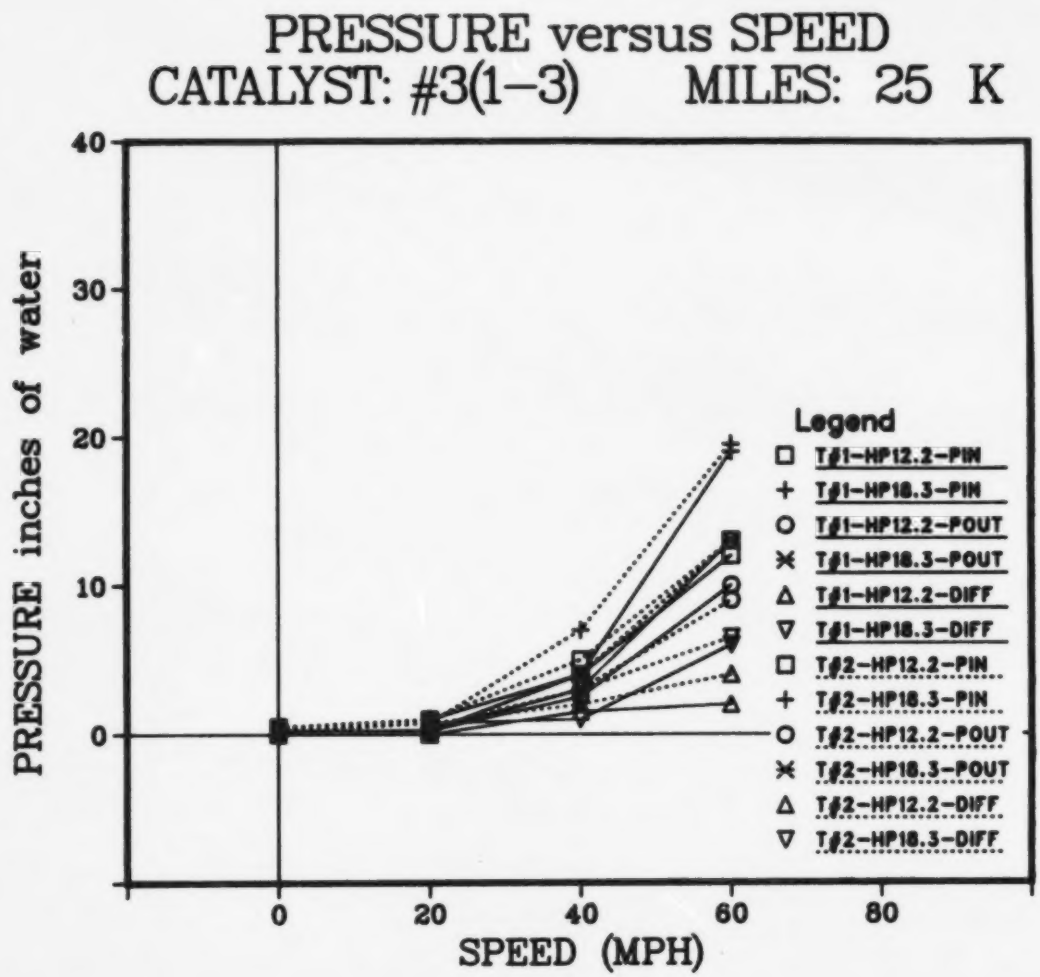

PRESSURE versus SPEED
CATALYST: #3(1-3) MILES: 15 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

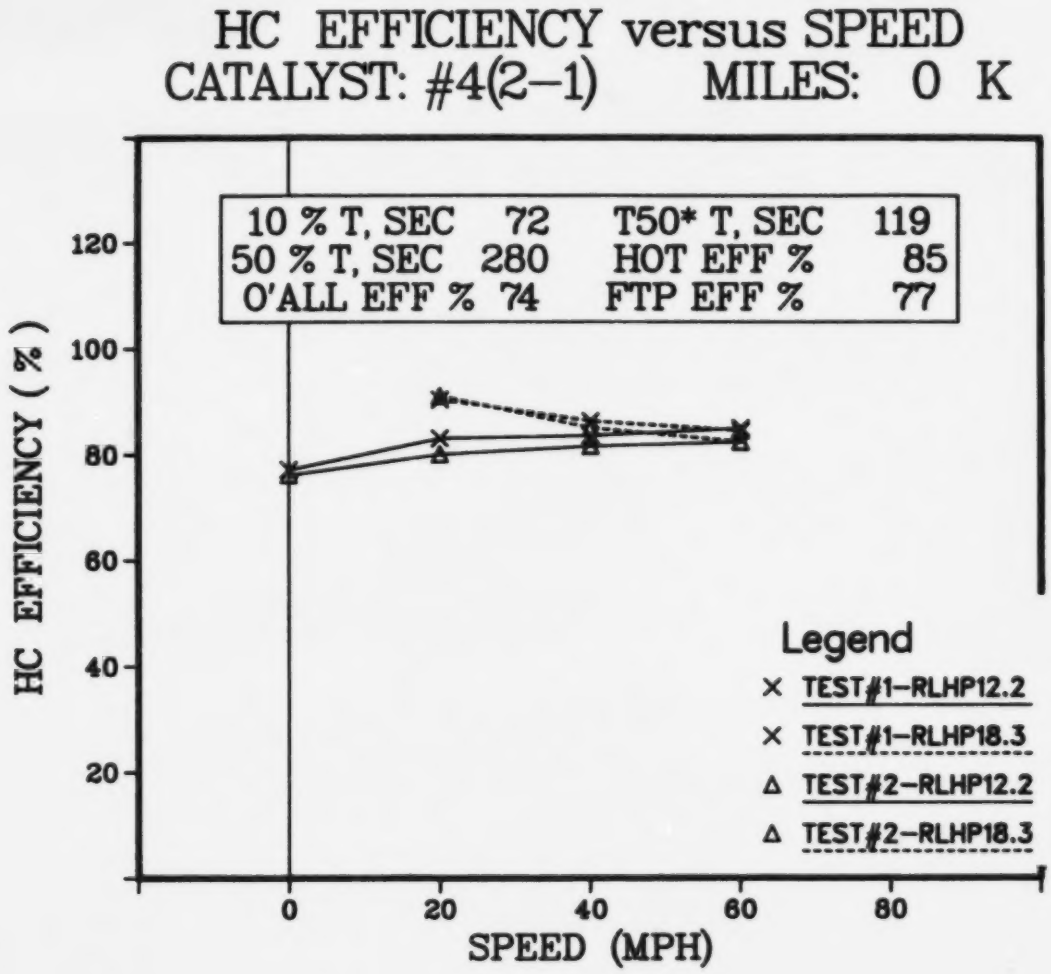

HC EFFICIENCY versus SPEED
CATALYST: #3(1–3) MILES: 25 K
10 % T, SEC 87
50 % T, SEC ---
O'ALL EFF % 28
T50* T, SEC ---
HOT EFF % 33
FTP EFF % 29
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3

CO EFFICIENCY versus SPEED
CATALYST: #3(1–3) MILES: 25 K

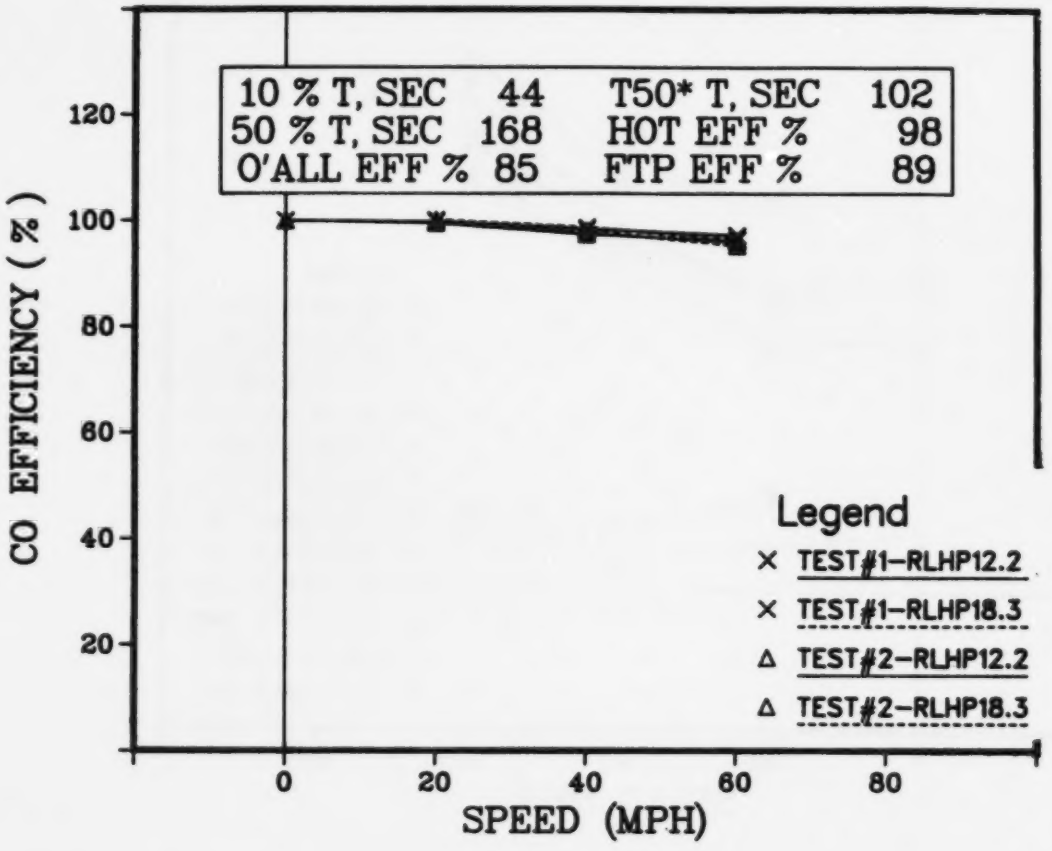


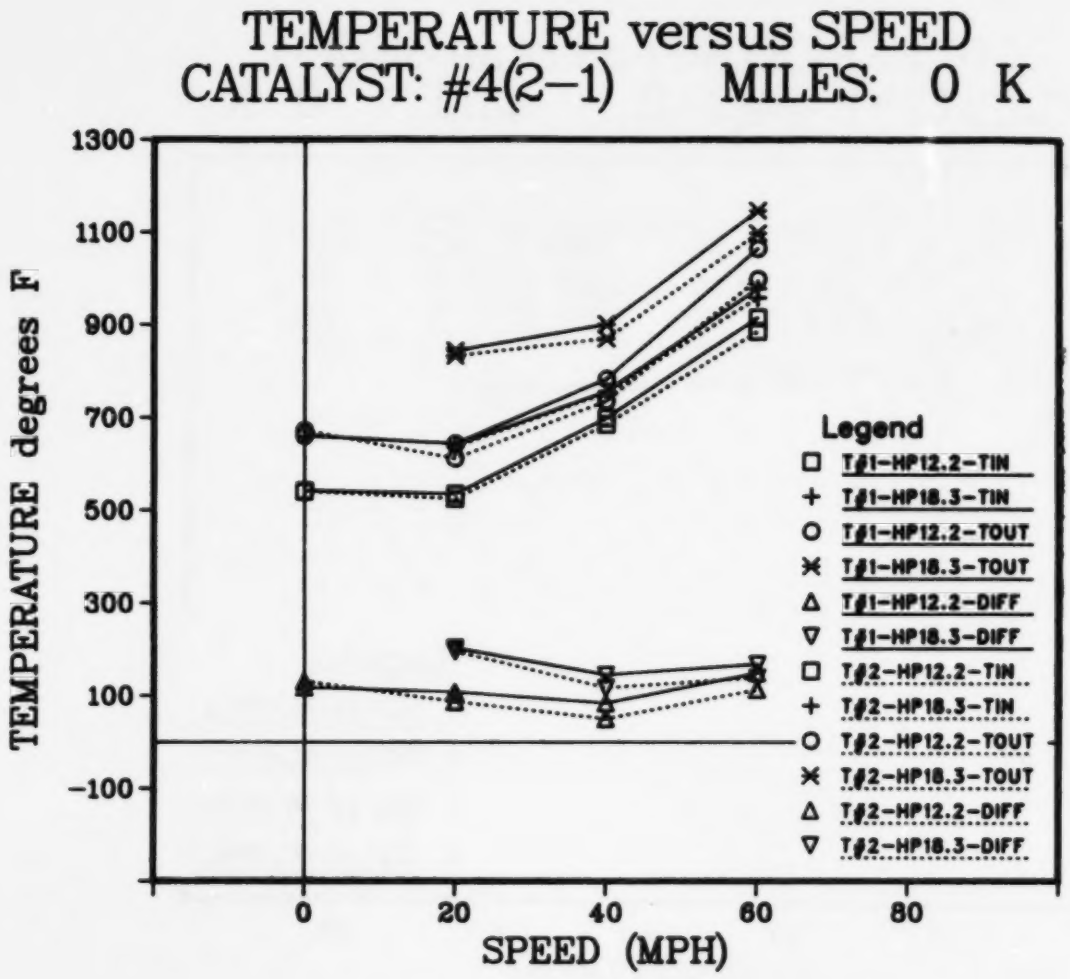

TEMPERATURE versus SPEED
CATALYST: #3(1–3) MILES: 25 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

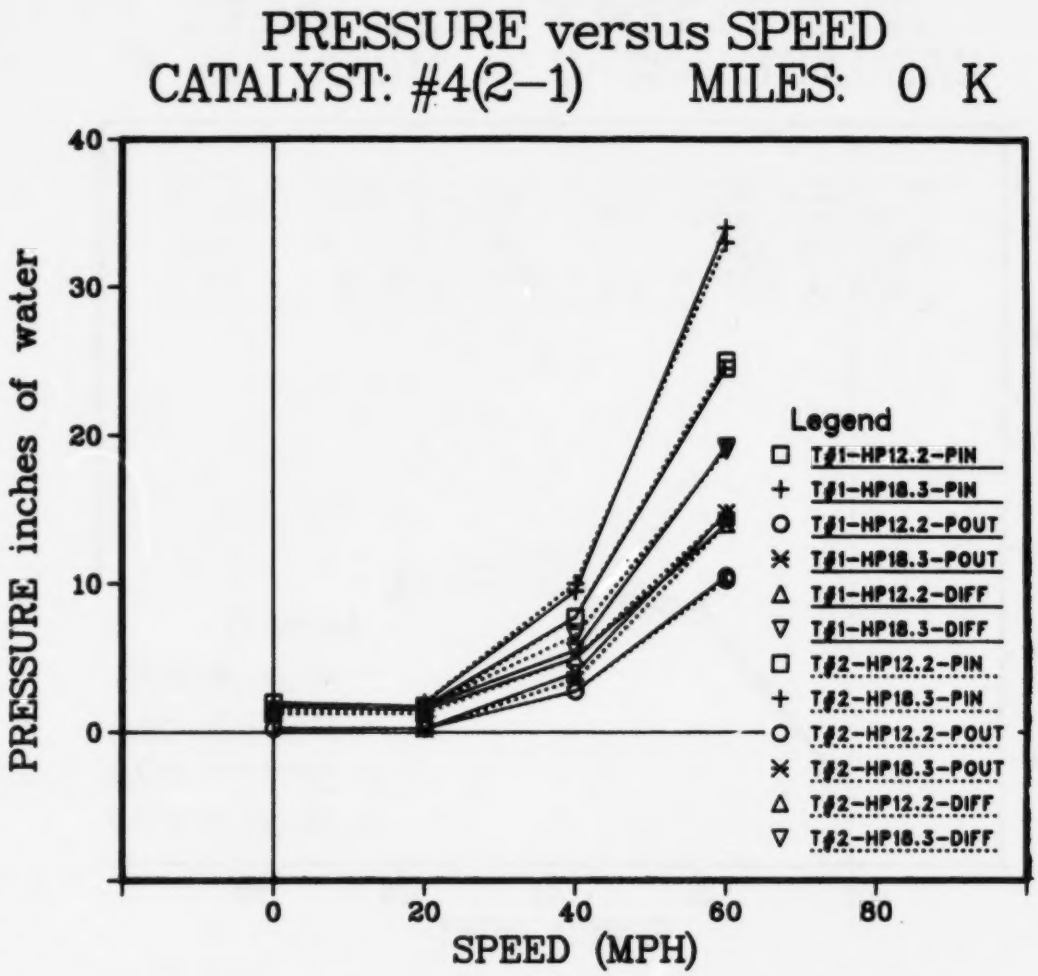

PRESSURE versus SPEED
CATALYST: #3(1–3) MILES: 25 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF


HC EFFICIENCY versus SPEED
CATALYST: #4(2–1) MILES: 0 K
10 % T, SEC 72
50 % T, SEC 280
O'ALL EFF % 74
T50* T, SEC 119
HOT EFF % 85
FTP EFF % 77
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1–RLHP12.2
× TEST#1–RLHP18.3
△ TEST#2–RLHP12.2
△ TEST#2–RLHP18.3

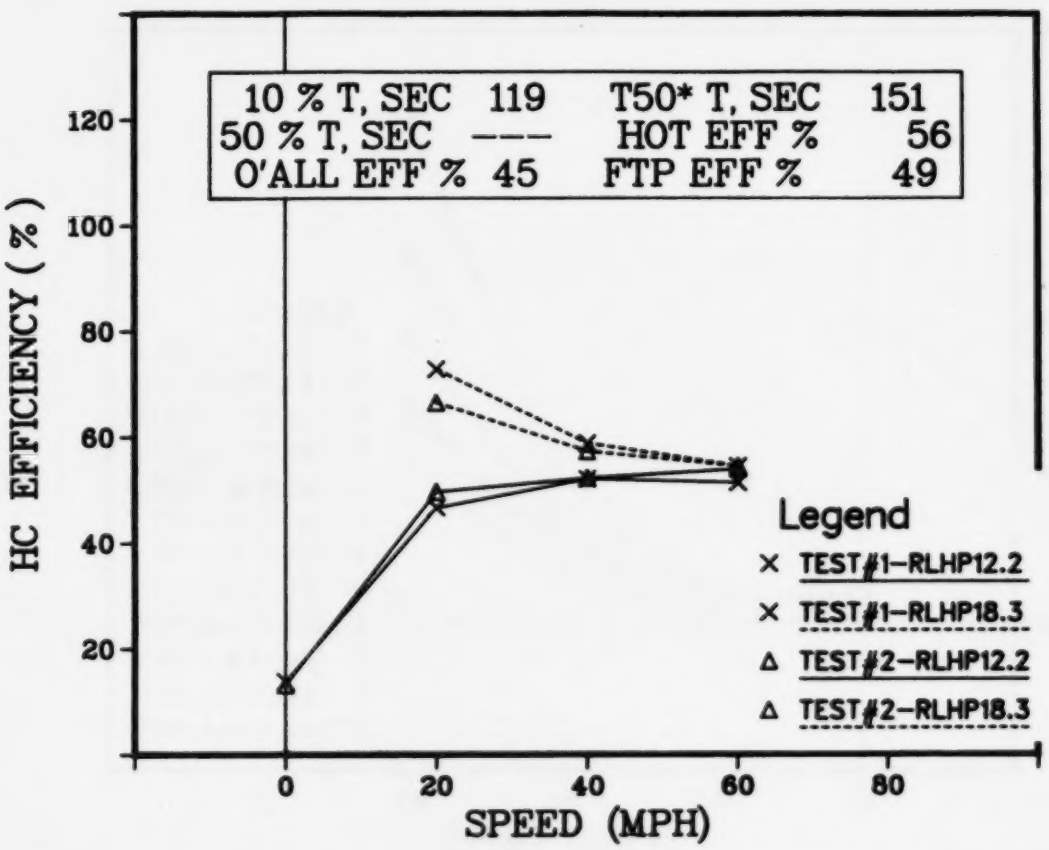
CO EFFICIENCY versus SPEED
CATALYST: #4(2–1) MILES: 0 K



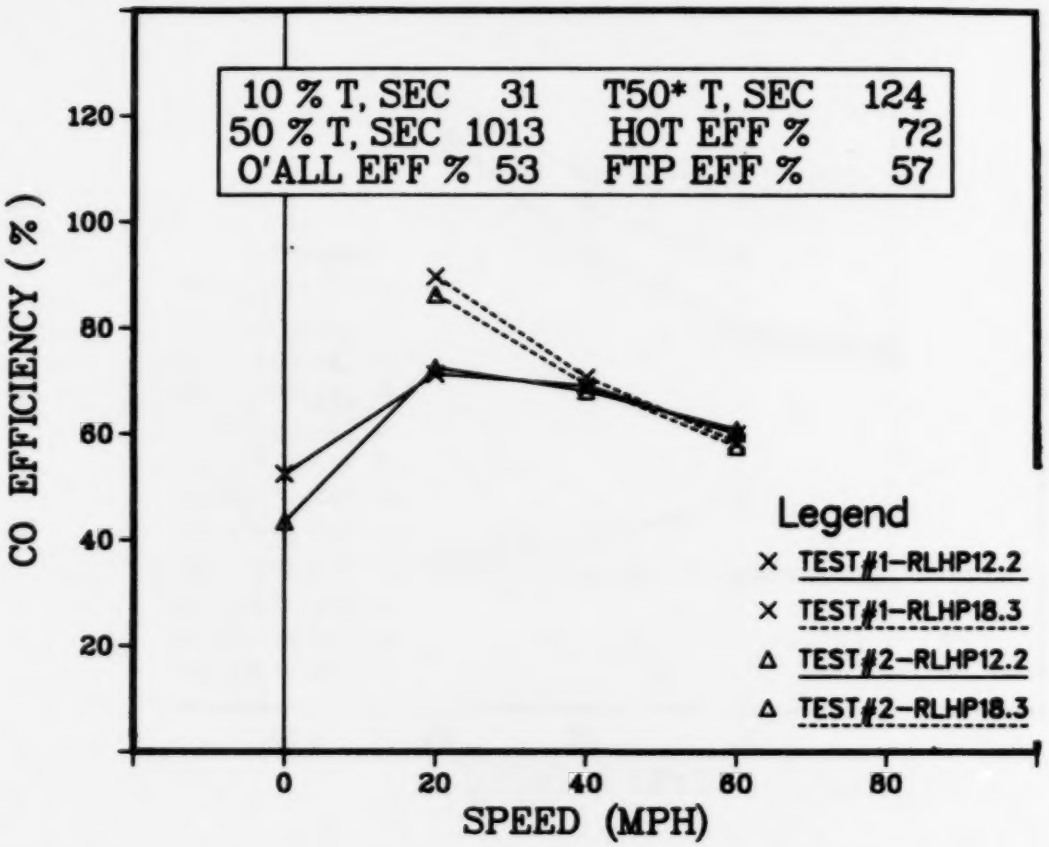

TEMPERATURE versus SPEED
CATALYST: #4(2-1) MILES: 0 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

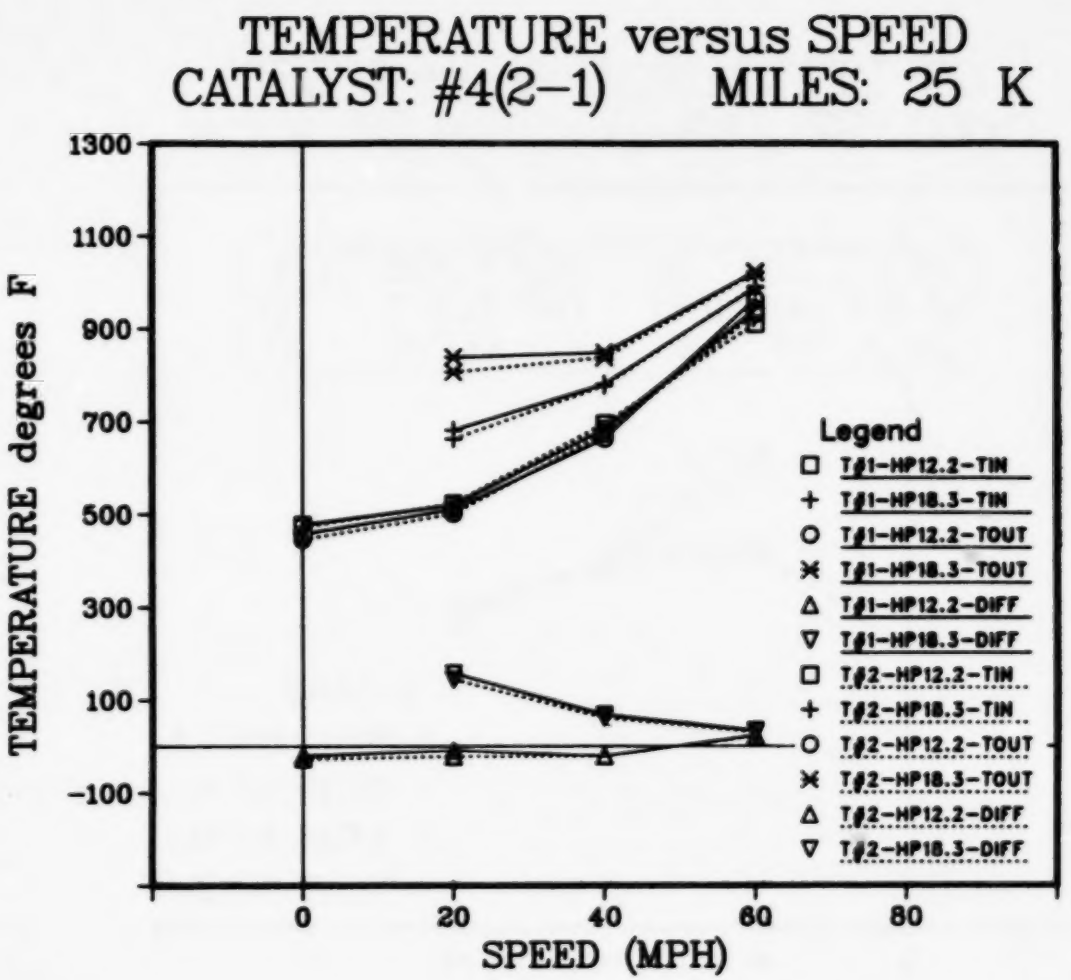

PRESSURE versus SPEED
CATALYST: #4(2–1) MILES: 0 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

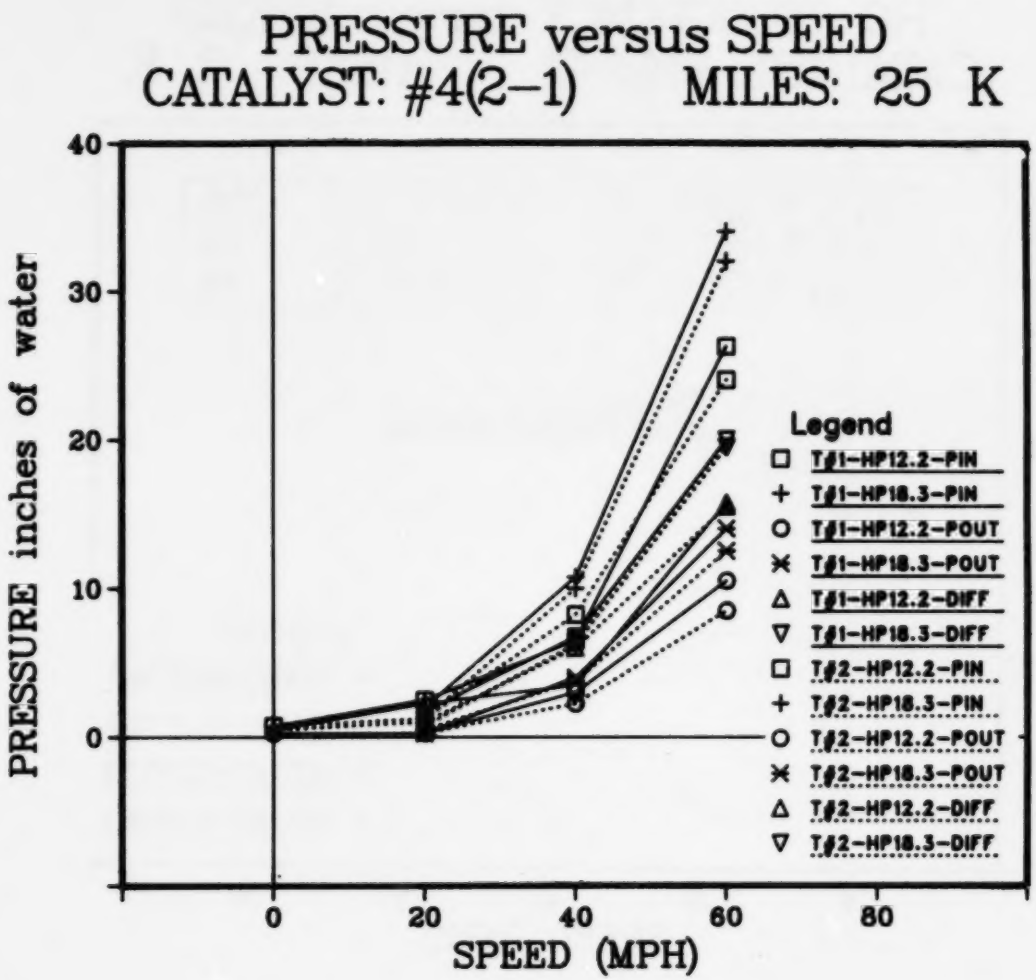
HC EFFICIENCY versus SPEED
CATALYST: #4(2–1) MILES: 25 K

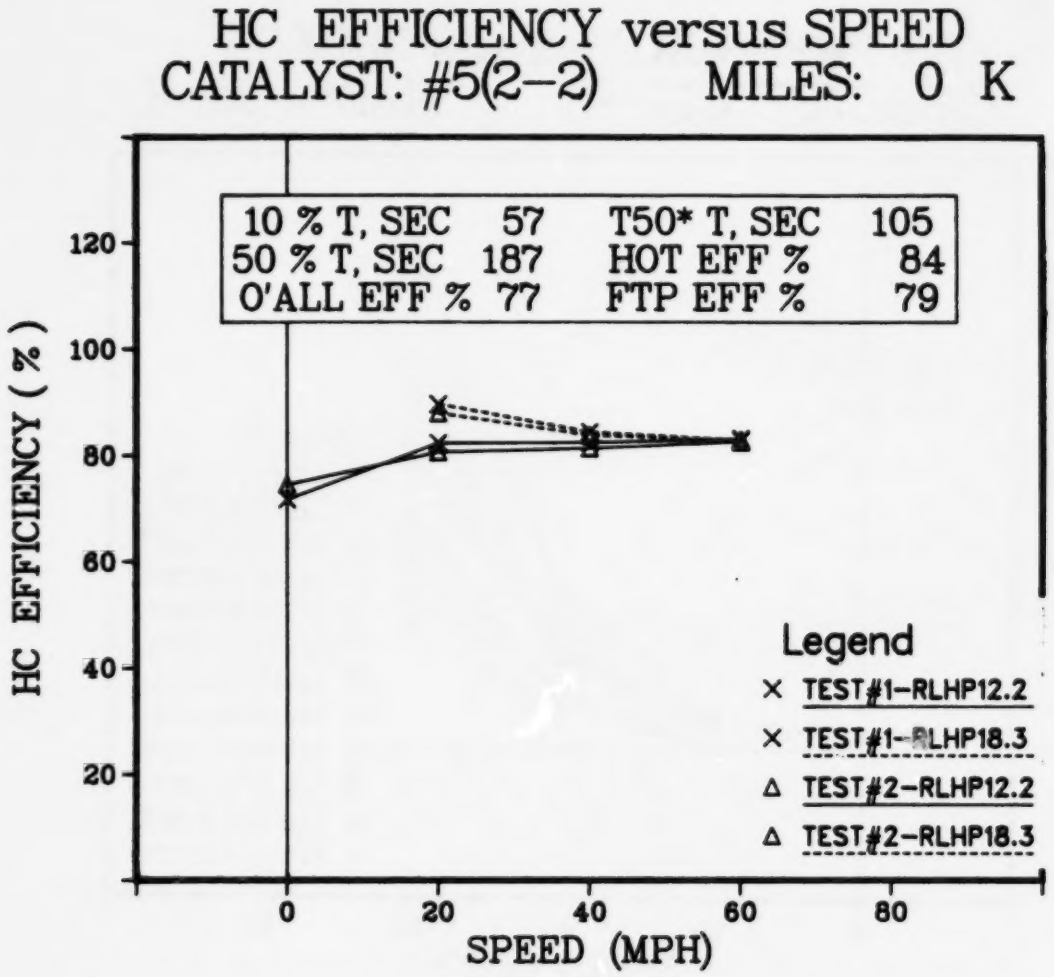


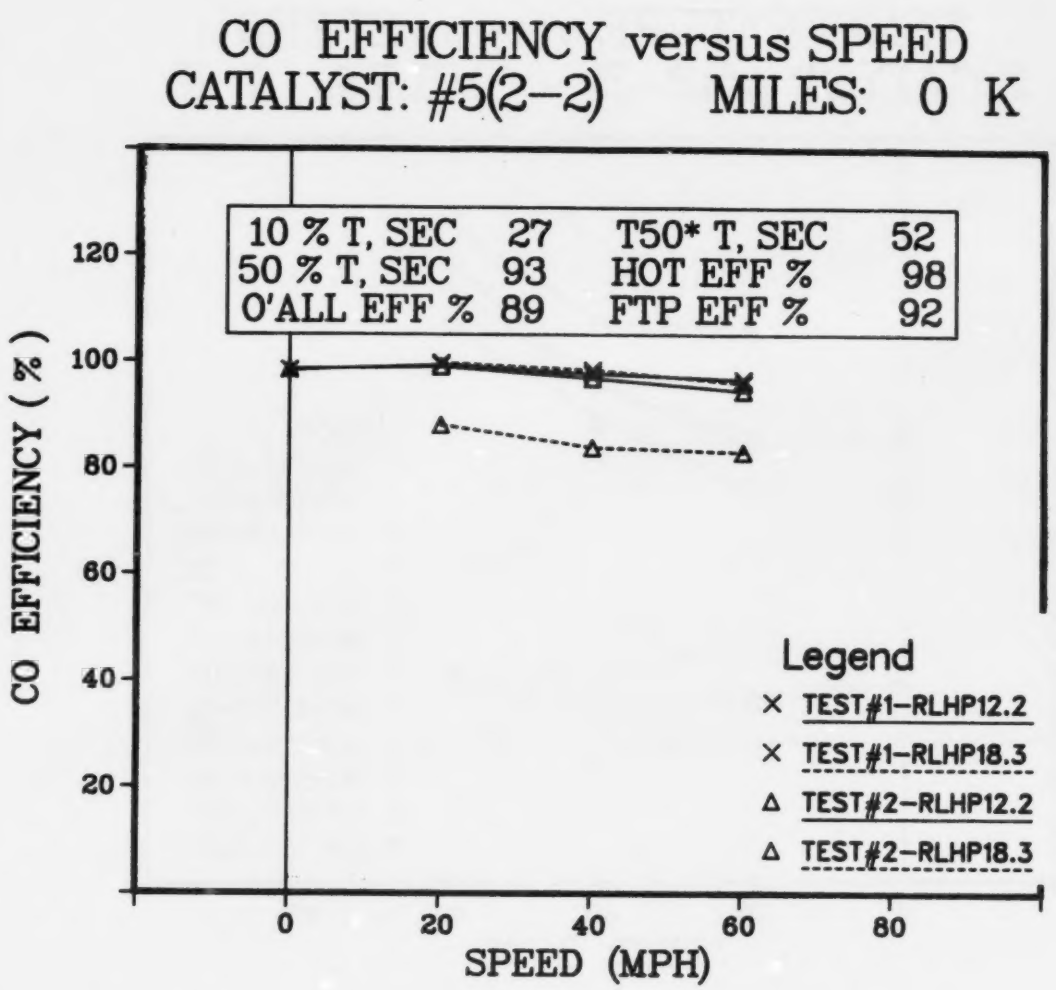
CO EFFICIENCY versus SPEED
CATALYST: #4(2–1) MILES: 25 K

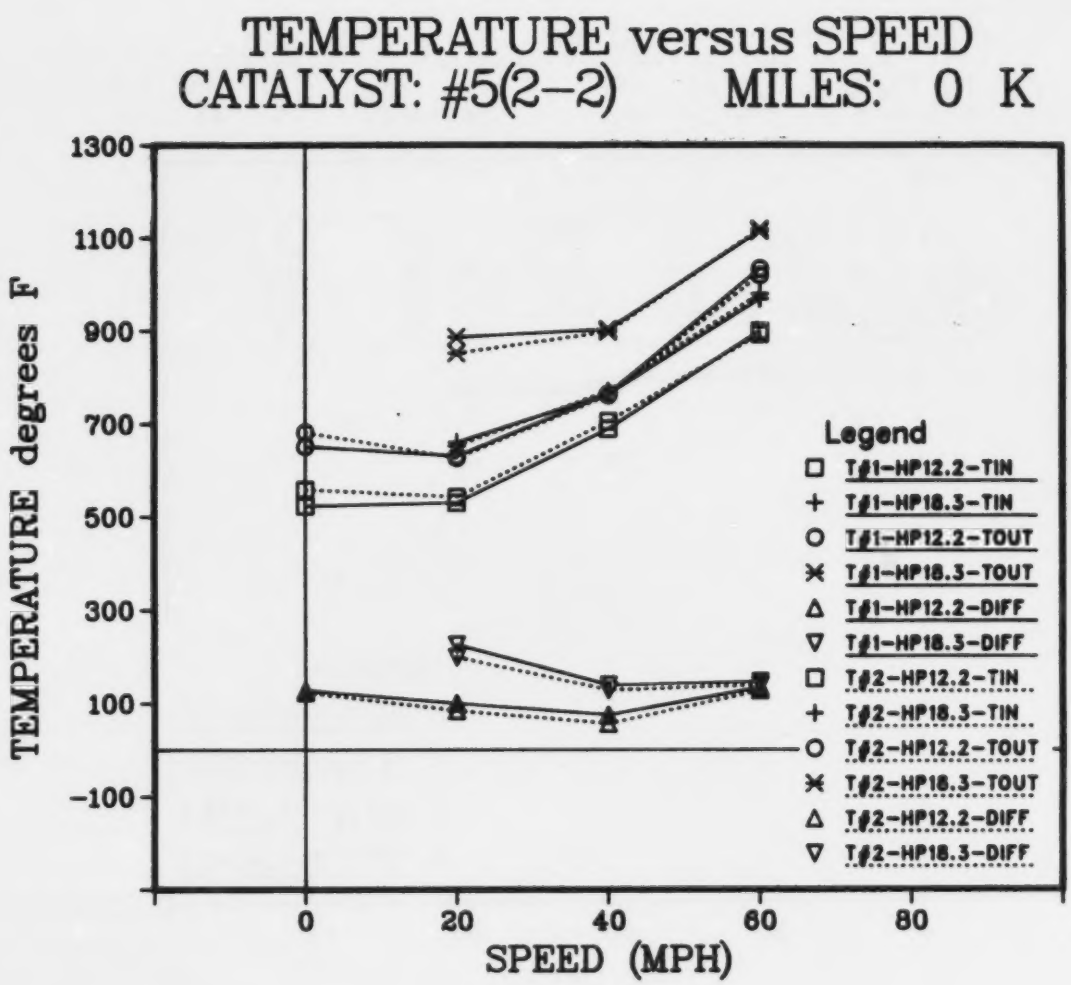


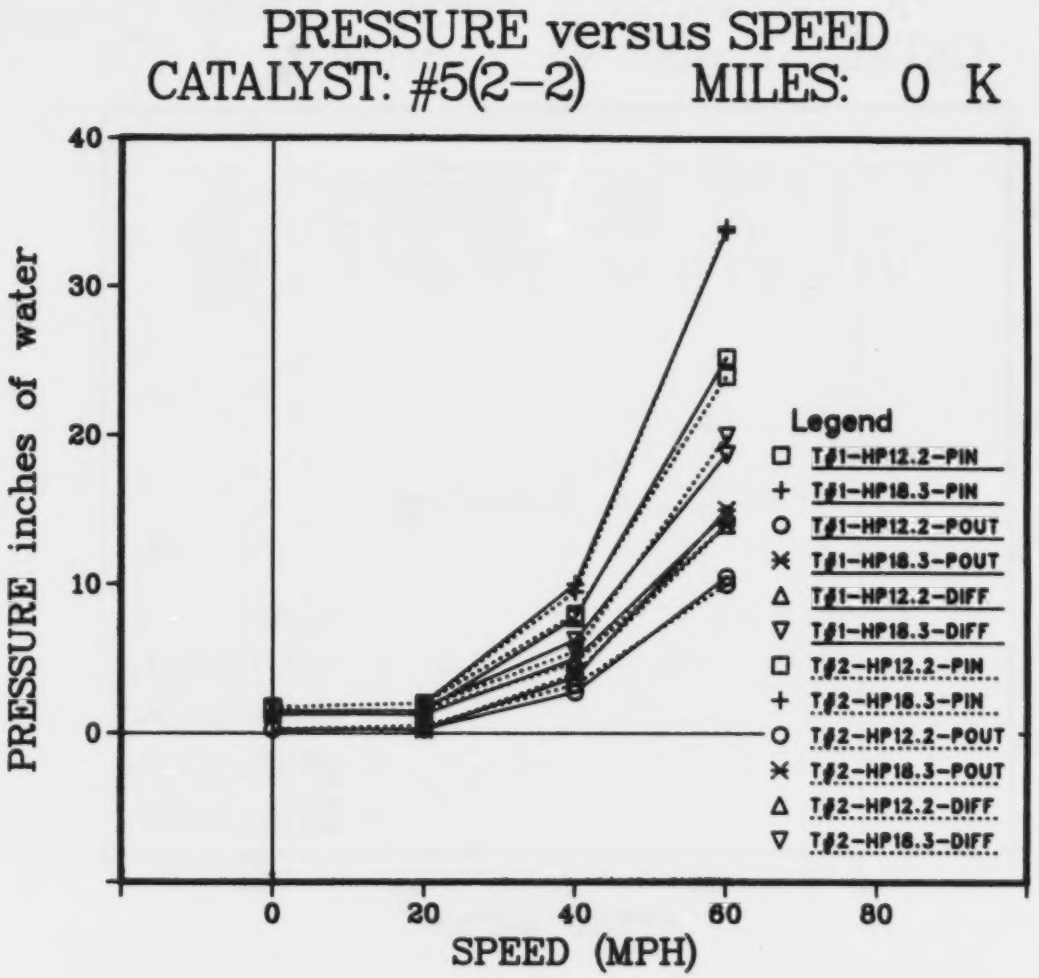

TEMPERATURE versus SPEED
CATALYST: #4(2–1) MILES: 25 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF


PRESSURE versus SPEED
CATALYST: #4(2–1) MILES: 25 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

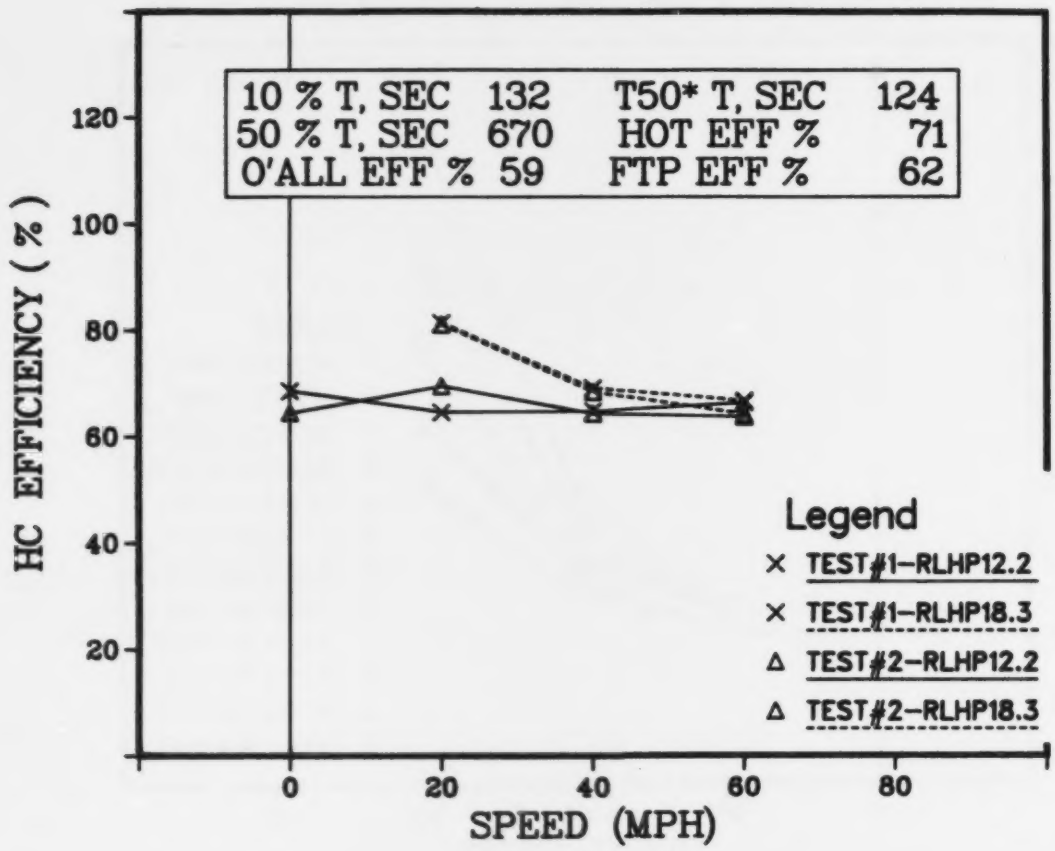

HC EFFICIENCY versus SPEED
CATALYST: #5(2–2) MILES: 0 K
10 % T, SEC 57
50 % T, SEC 187
O'ALL EFF % 77
T50* T, SEC 105
HOT EFF % 84
FTP EFF % 79
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1–RLHP12.2
× TEST#1–RLHP18.3
Δ TEST#2–RLHP12.2
Δ TEST#2–RLHP18.3

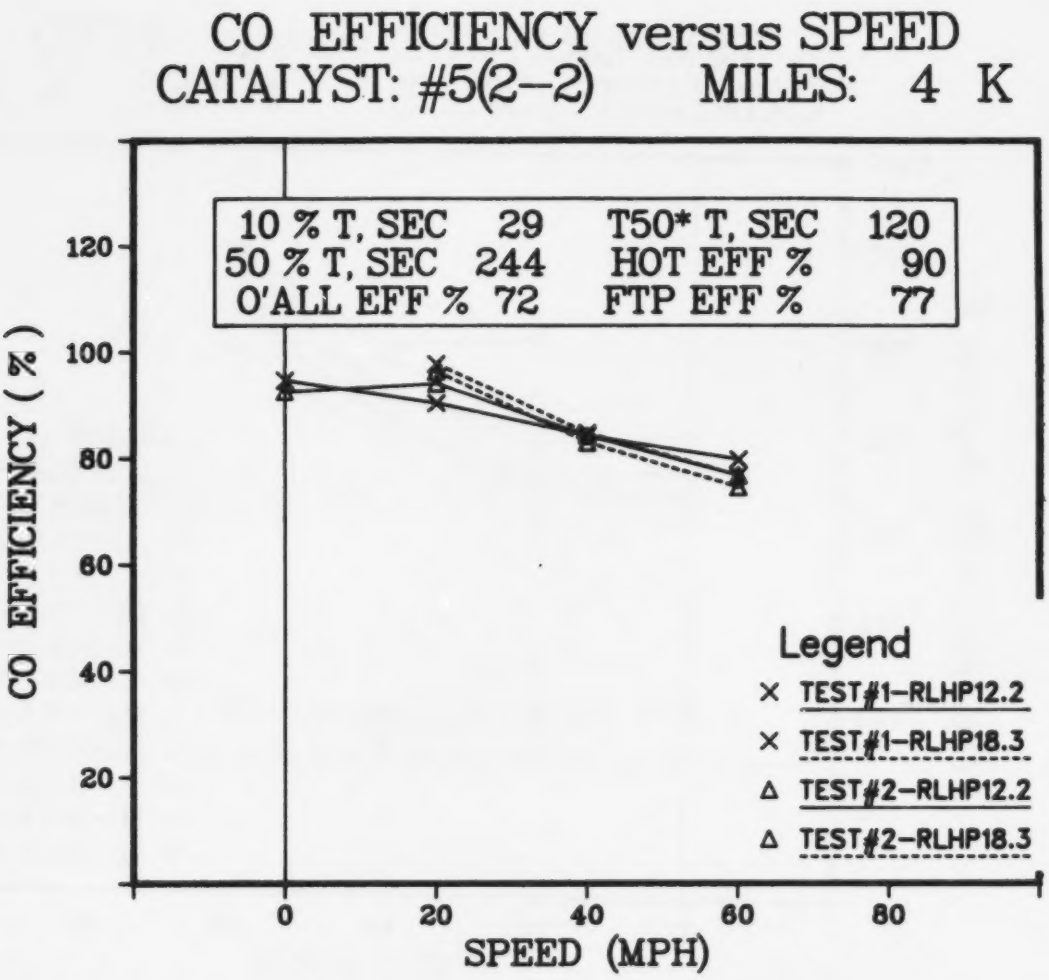

CO EFFICIENCY versus SPEED
CATALYST: #5(2-2) MILES: 0 K
10 % T, SEC 27
50 % T, SEC 93
O'ALL EFF % 89
T50* T, SEC 52
HOT EFF % 98
FTP EFF % 92
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1-RLHP12.2
TEST#1-RLHP18.3
TEST#2-RLHP12.2
TEST#2-RLHP18.3

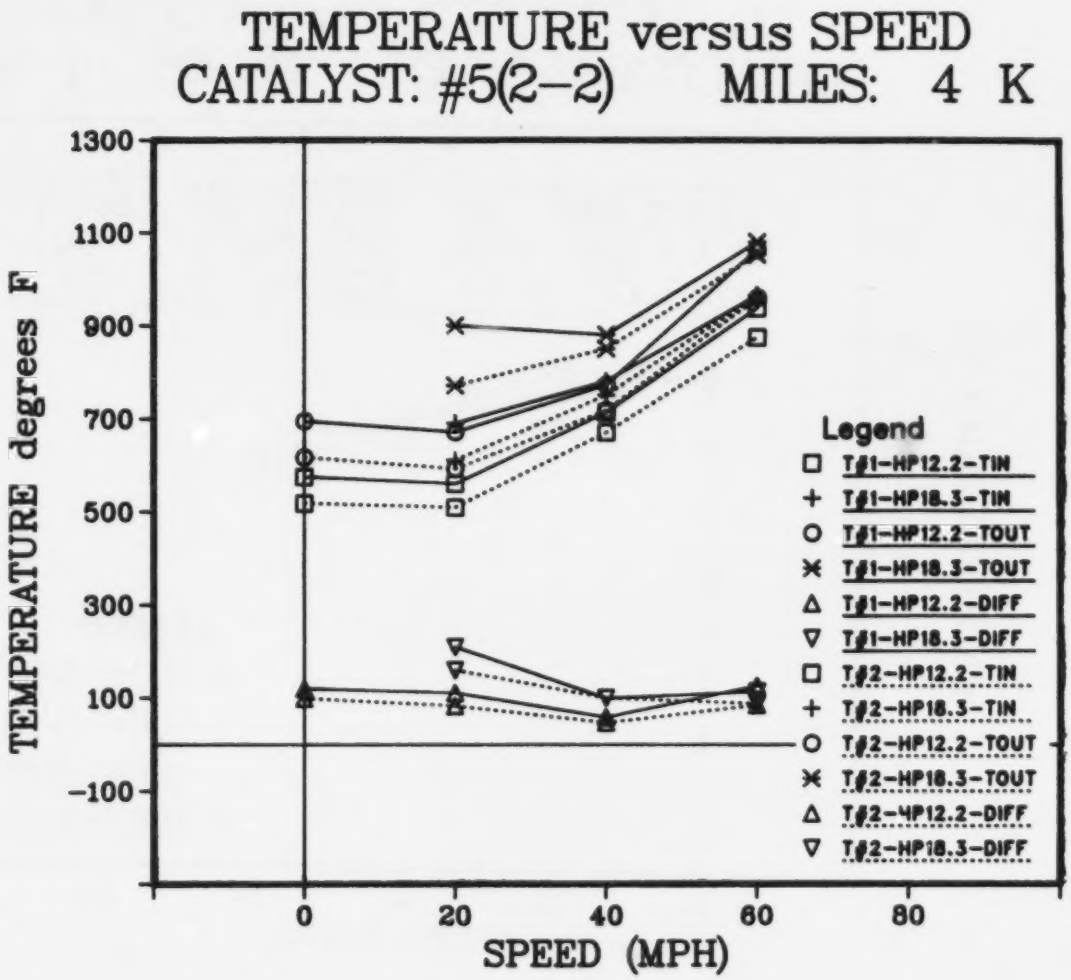

TEMPERATURE versus SPEED
CATALYST: #5(2-2) MILES: 0 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

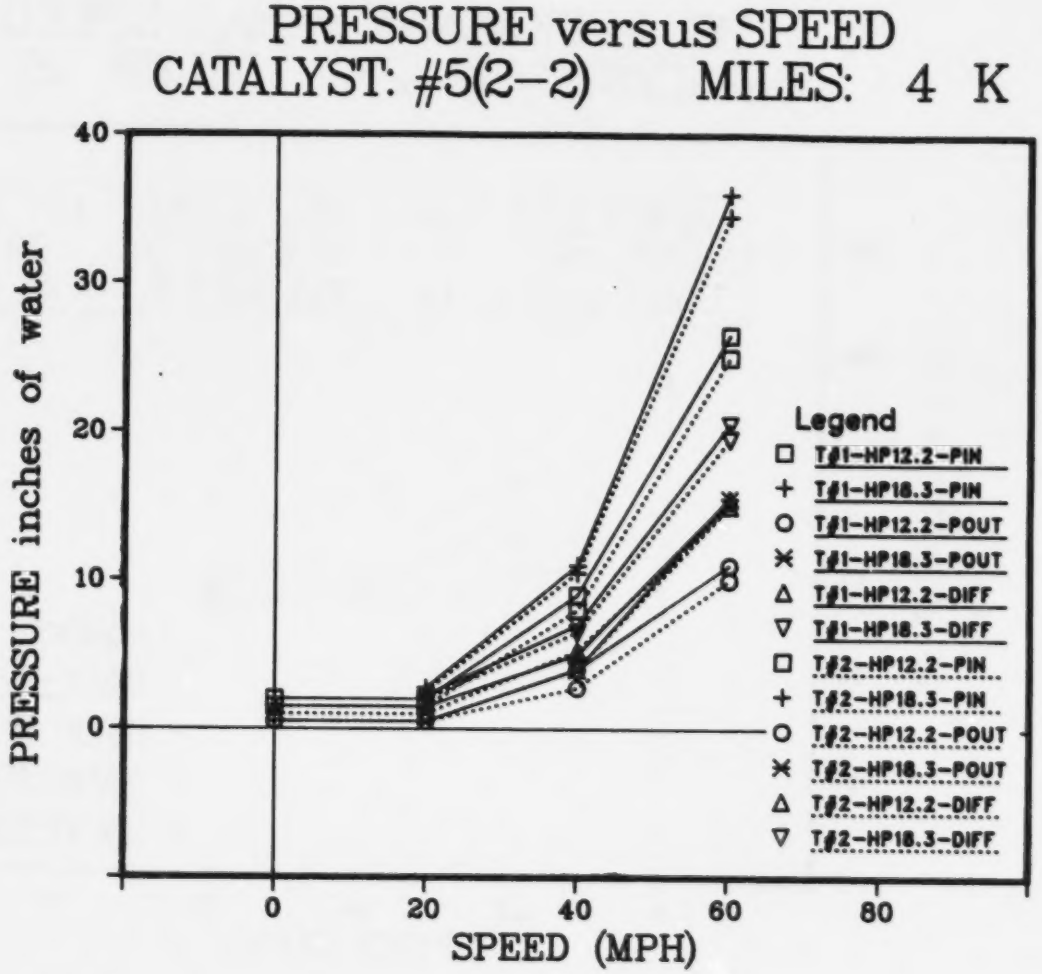

PRESSURE versus SPEED
CATALYST: #5(2-2) MILES: 0 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

HC EFFICIENCY versus SPEED
CATALYST: #5(2–2) MILES: 4 K

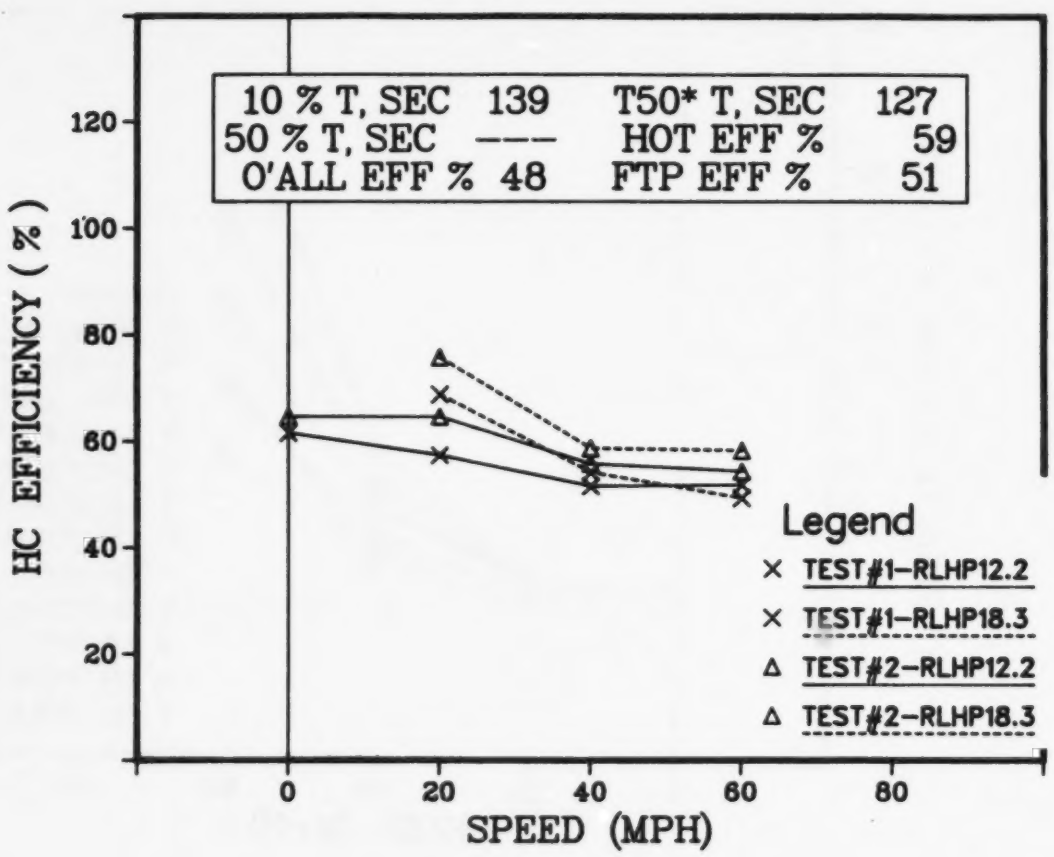


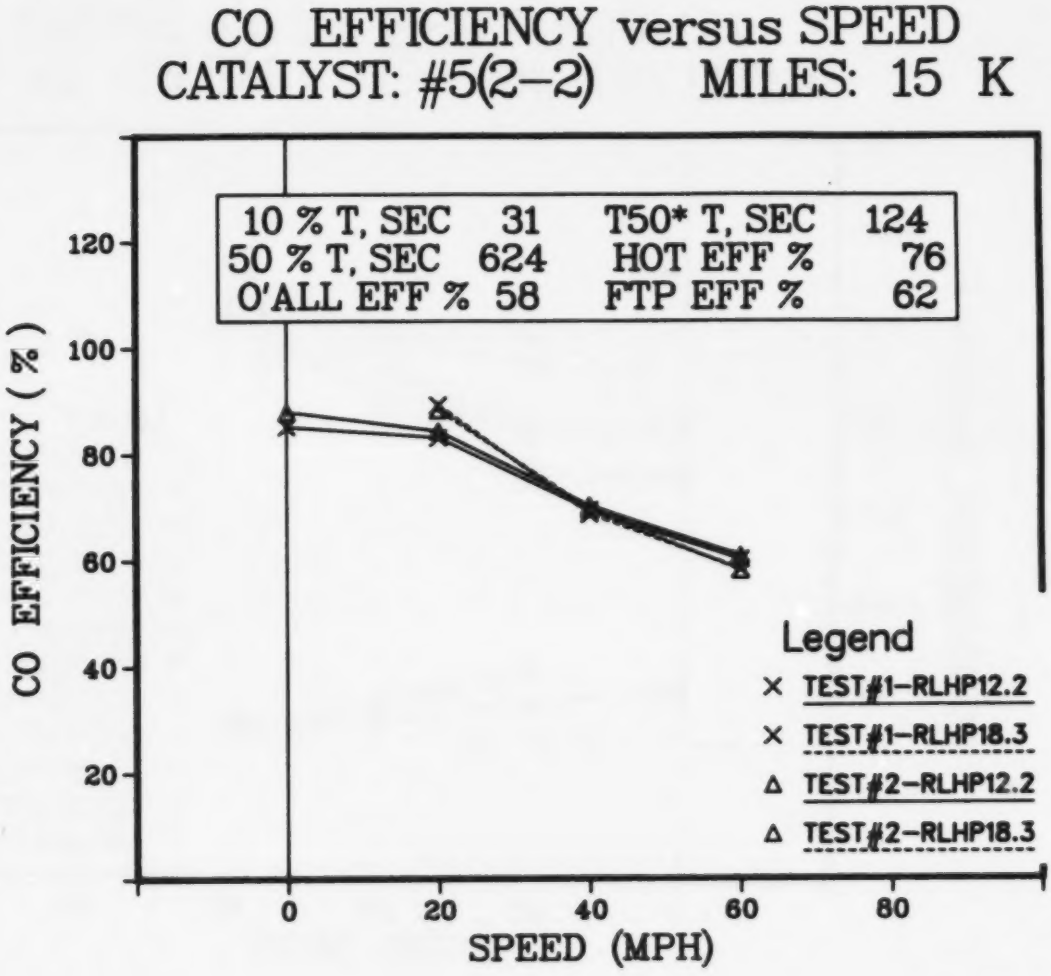

CO EFFICIENCY versus SPEED
CATALYST: #5(2-2) MILES: 4 K
10 % T, SEC 29
50 % T, SEC 244
O'ALL EFF % 72
T50* T, SEC 120
HOT EFF % 90
FTP EFF % 77
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1-RLHP12.2
TEST#1-RLHP18.3
TEST#2-RLHP12.2
TEST#2-RLHP18.3

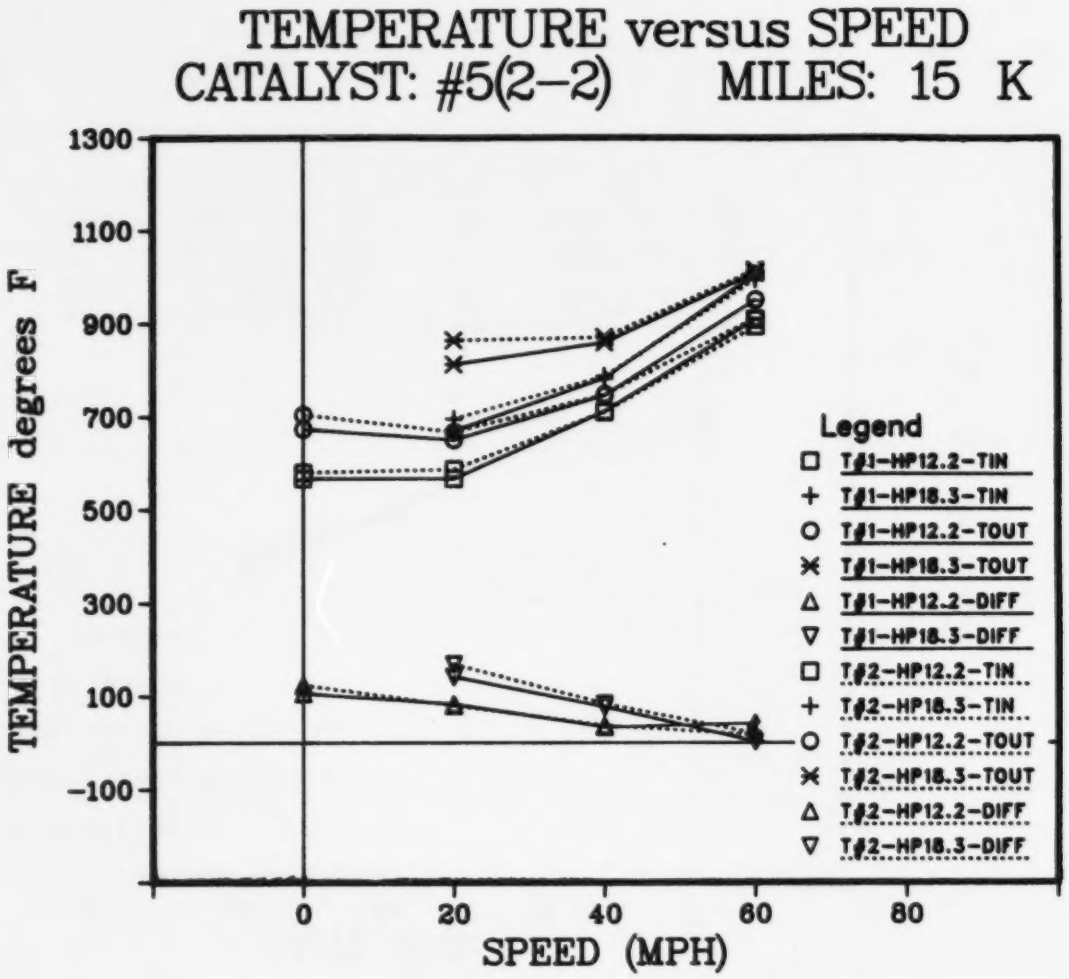

TEMPERATURE versus SPEED
CATALYST: #5(2-2) MILES: 4 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

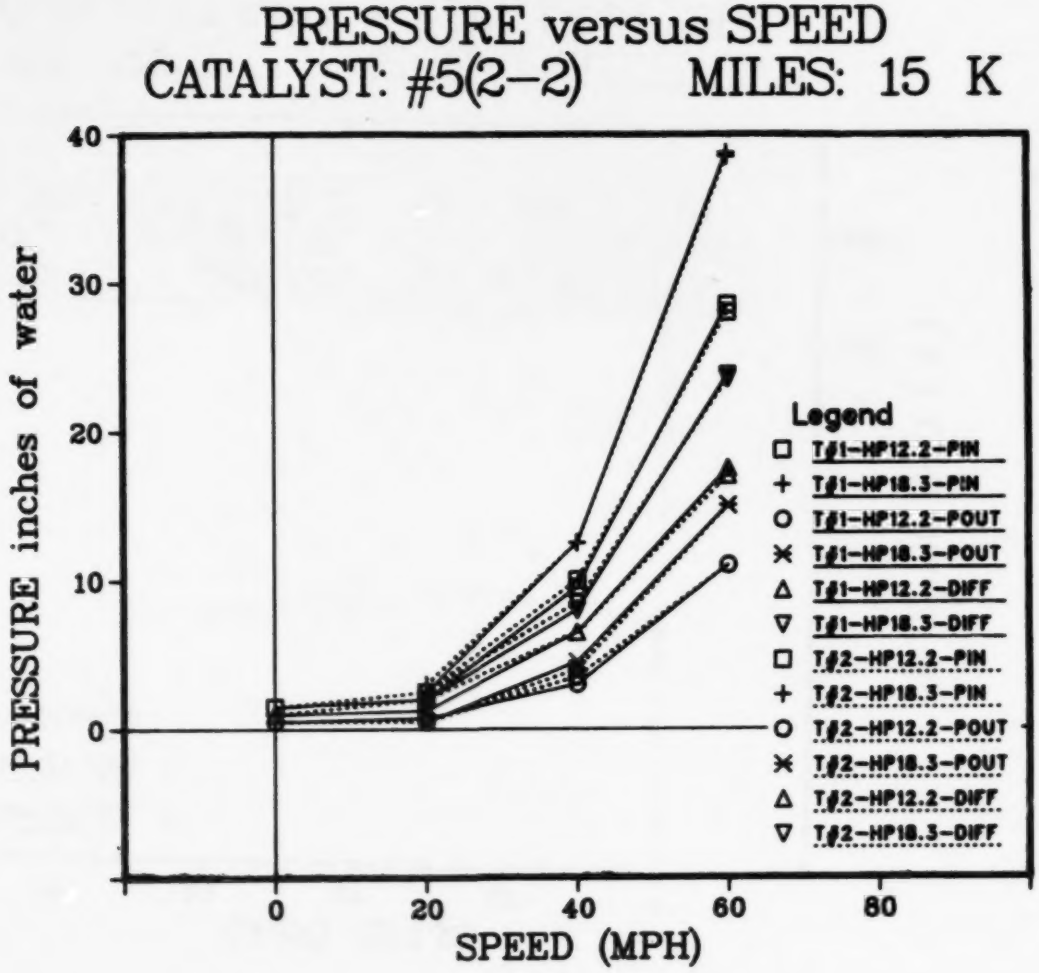

PRESSURE versus SPEED
CATALYST: #5(2-2) MILES: 4 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

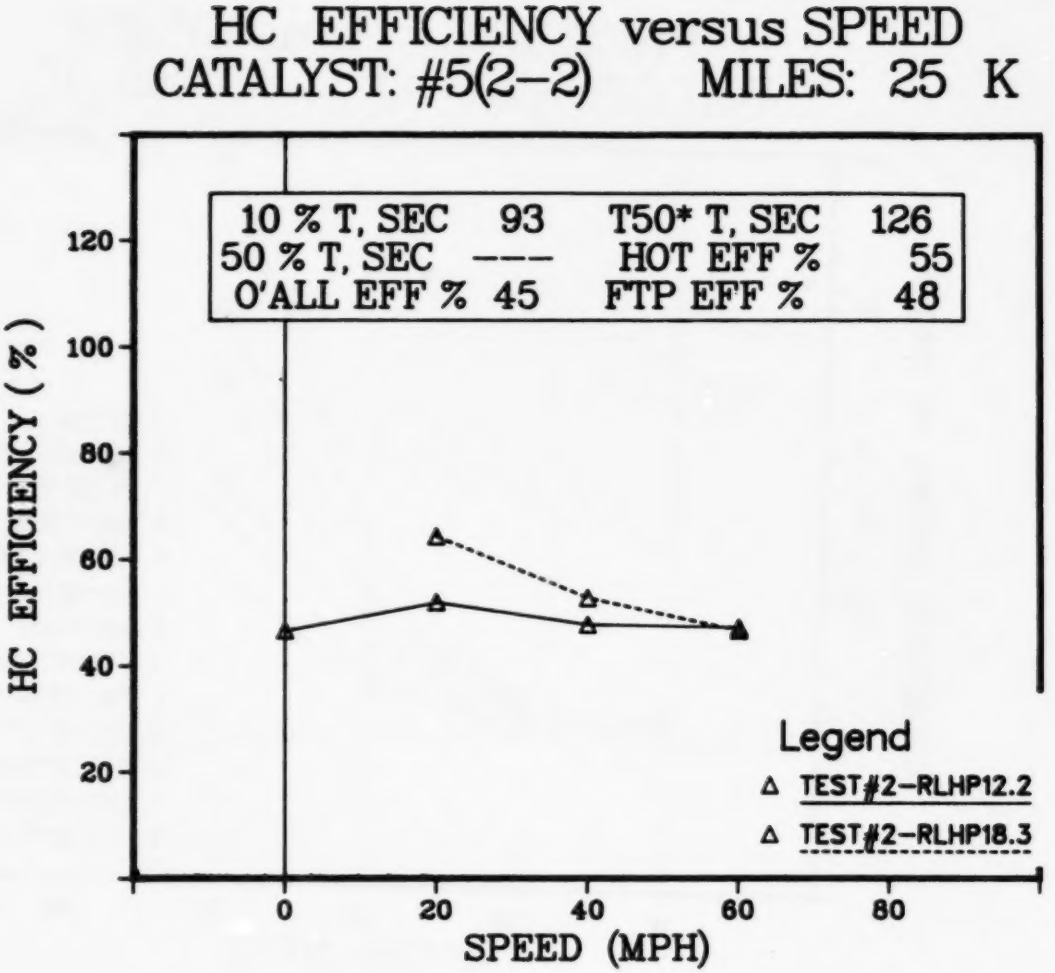
HC EFFICIENCY versus SPEED
CATALYST: #5(2–2) MILES: 15 K



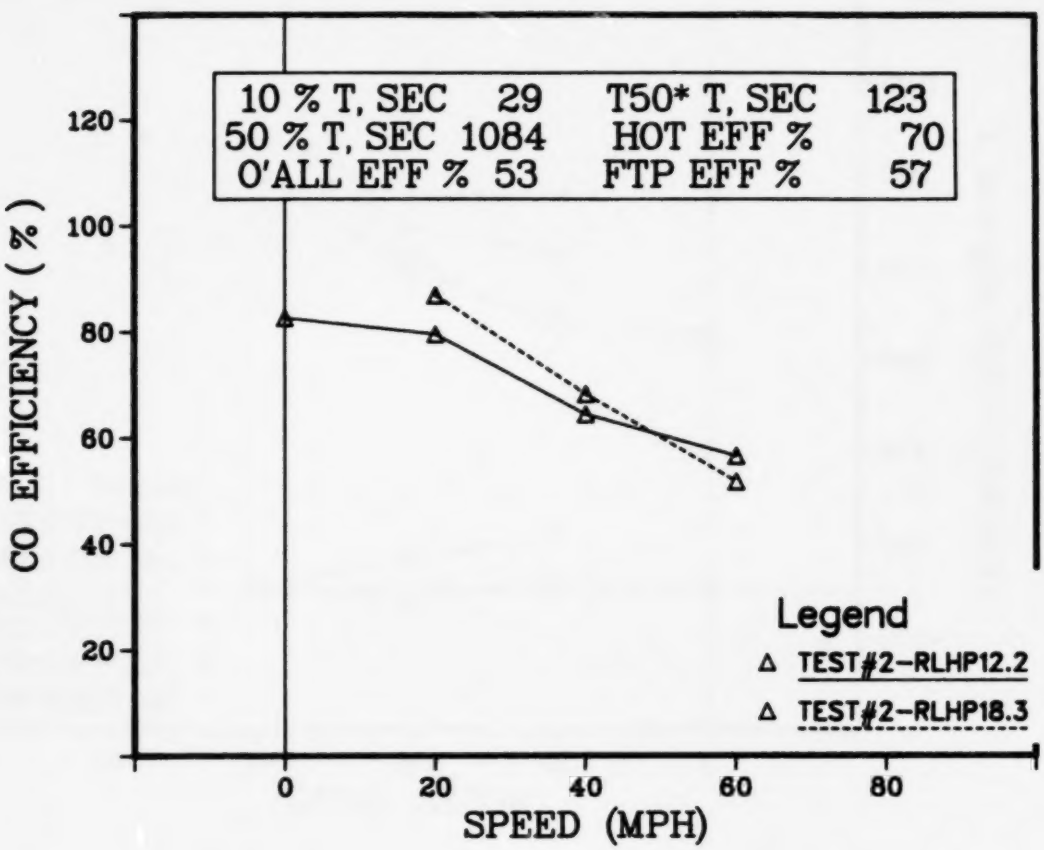

CO EFFICIENCY versus SPEED
CATALYST: #5(2-2) MILES: 15 K
10 % T, SEC 31
50 % T, SEC 624
O'ALL EFF % 58
T50* T, SEC 124
HOT EFF % 76
FTP EFF % 62
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1-RLHP12.2
× TEST#1-RLHP18.3
Δ TEST#2-RLHP12.2
Δ TEST#2-RLHP18.3

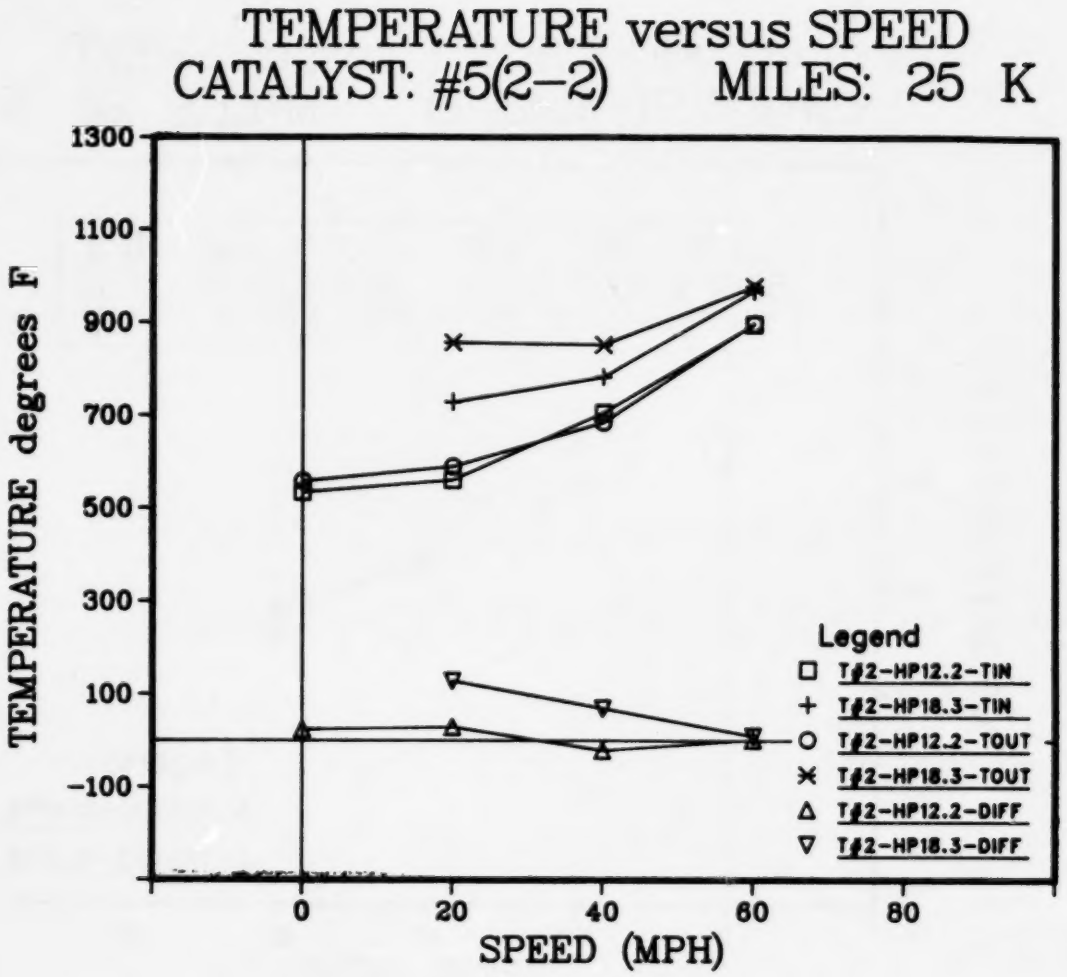

TEMPERATURE versus SPEED
CATALYST: #5(2-2) MILES: 15 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

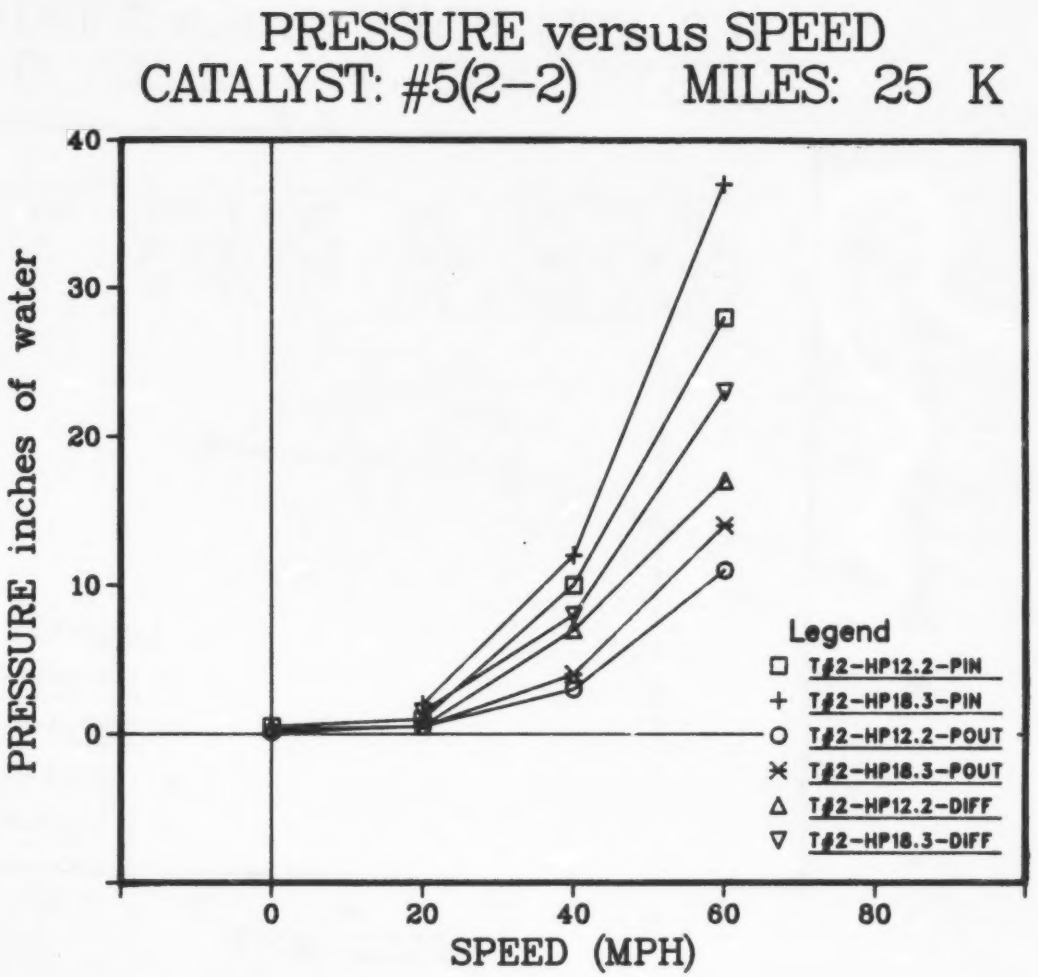

PRESSURE versus SPEED
CATALYST: #5(2-2) MILES: 15 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF


HC EFFICIENCY versus SPEED
CATALYST: #5(2-2) MILES: 25 K
10 % T, SEC 93
T50* T, SEC 126
50 % T, SEC ---
HOT EFF % 55
O'ALL EFF % 45
FTP EFF % 48
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#2-RLHP12.2
TEST#2-RLHP18.3

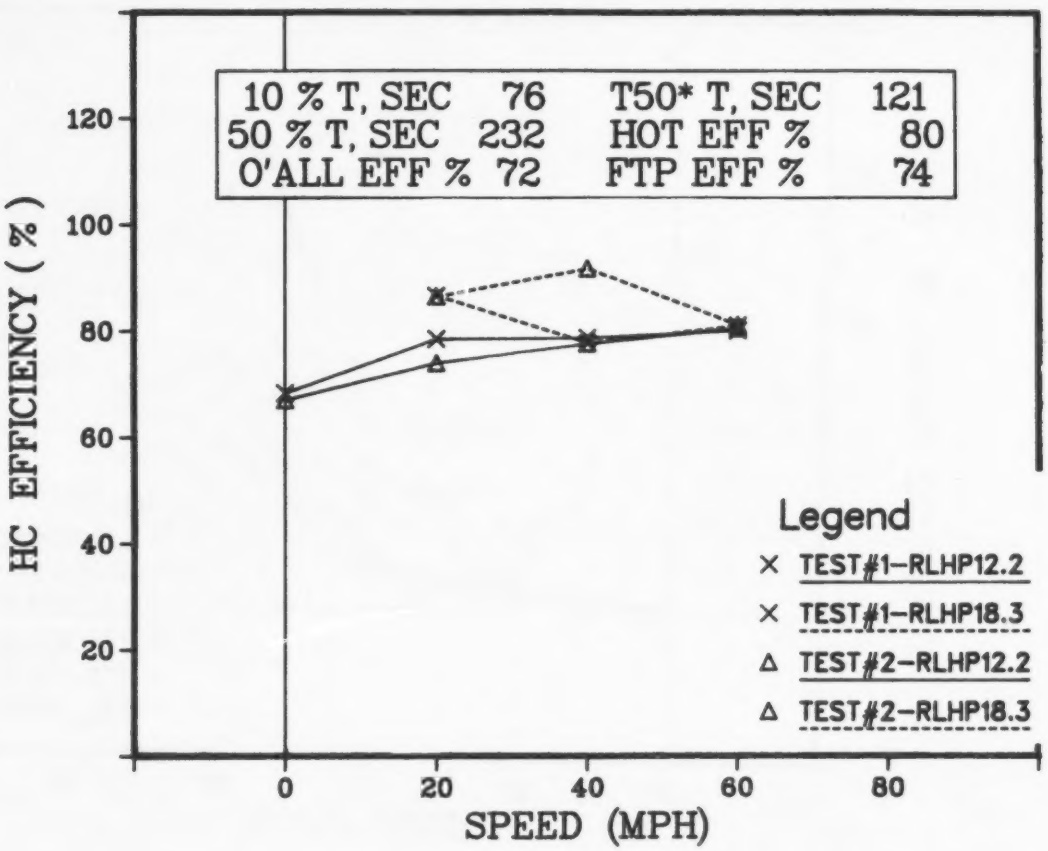
CO EFFICIENCY versus SPEED
CATALYST: #5(2–2) MILES: 25 K

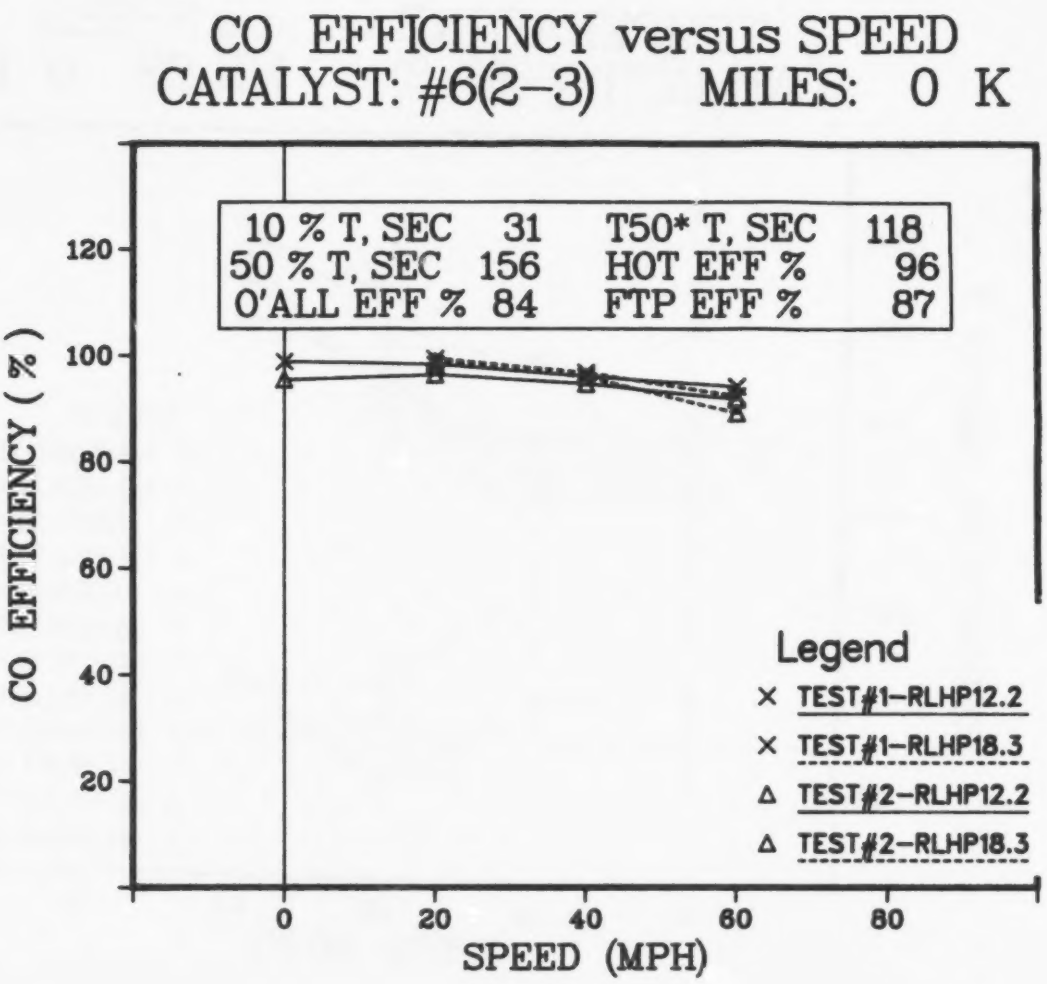


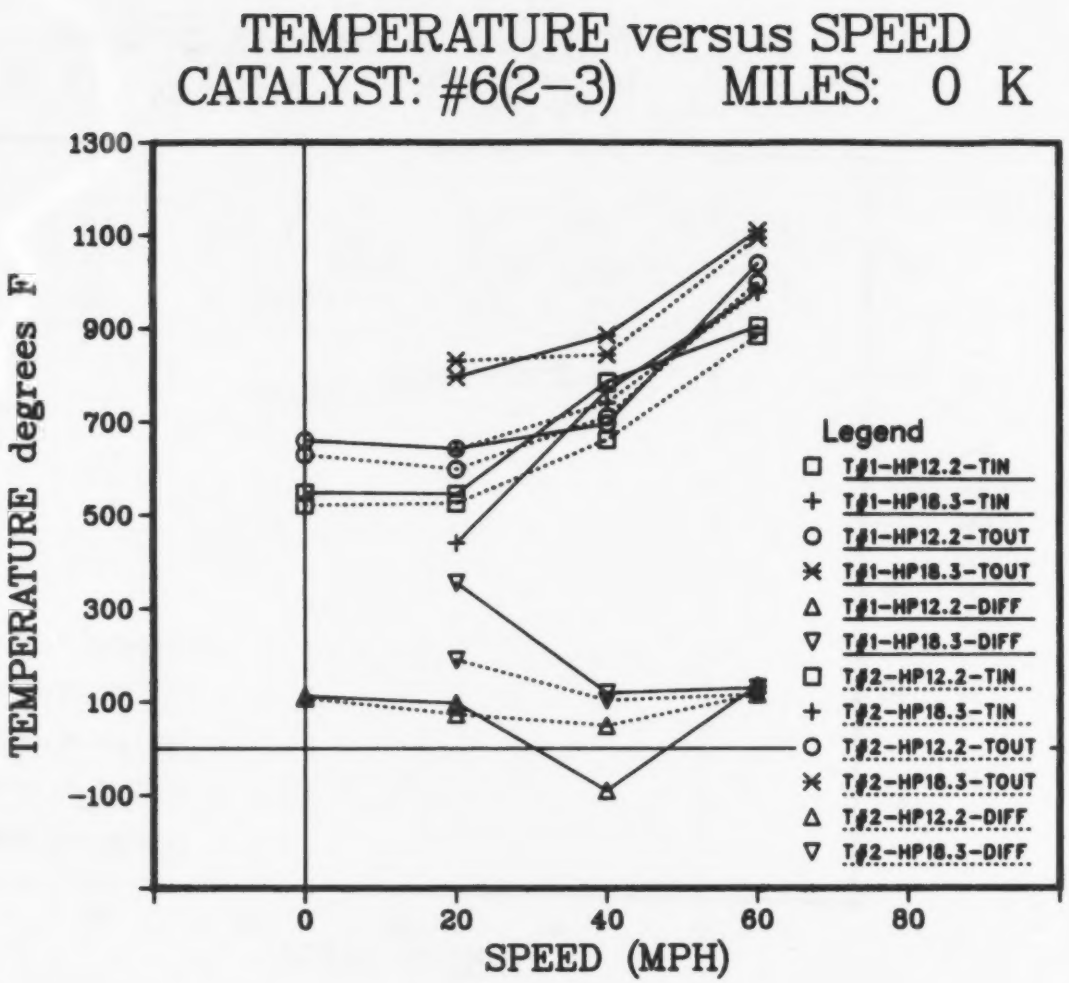

TEMPERATURE versus SPEED
CATALYST: #5(2-2) MILES: 25 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

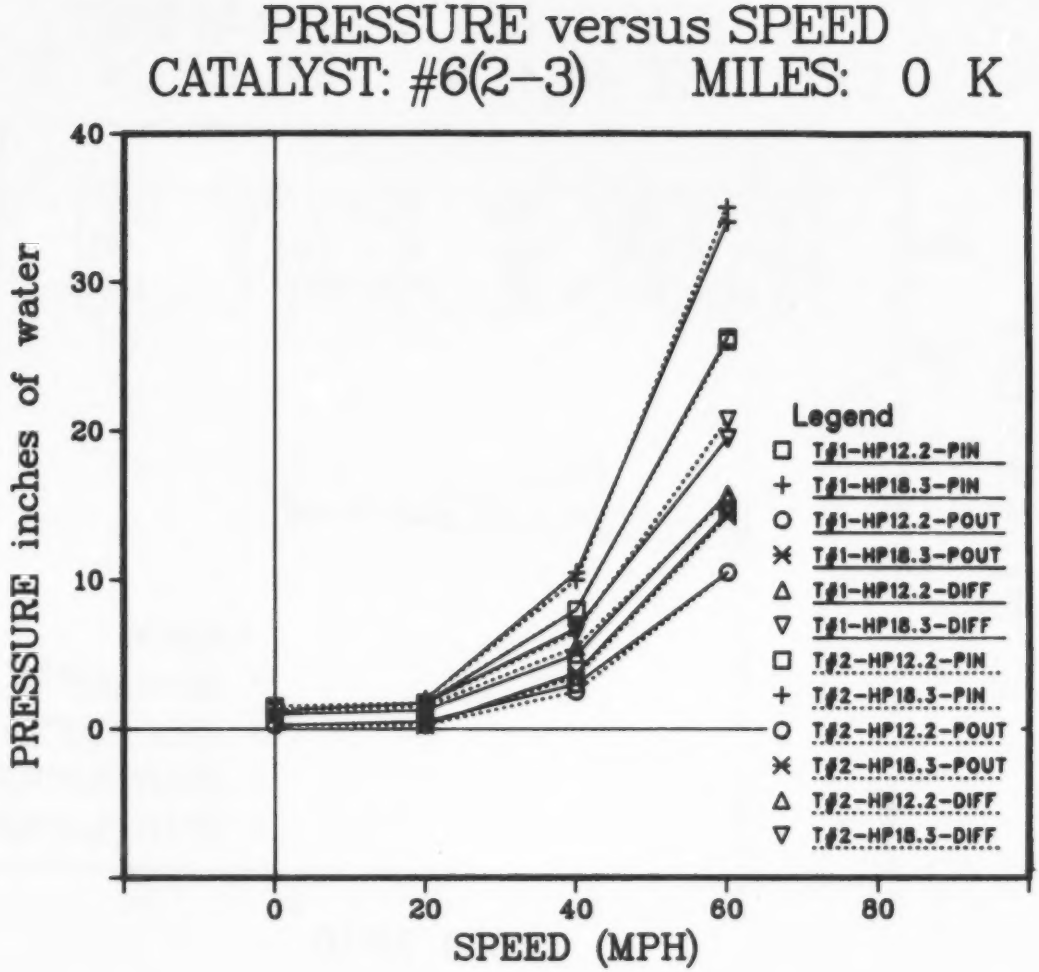

PRESSURE versus SPEED
CATALYST: #5(2-2) MILES: 25 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

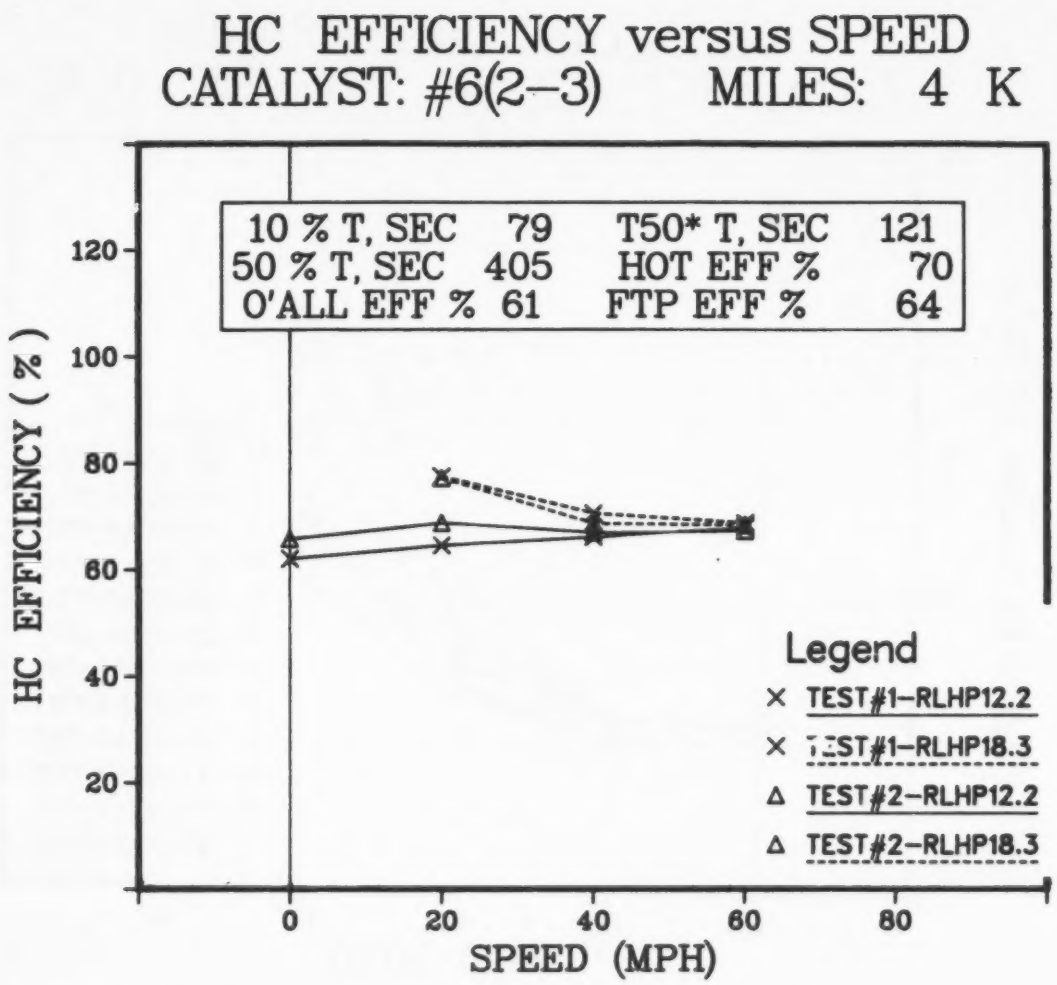
HC EFFICIENCY versus SPEED
CATALYST: #6(2-3) MILES: 0 K

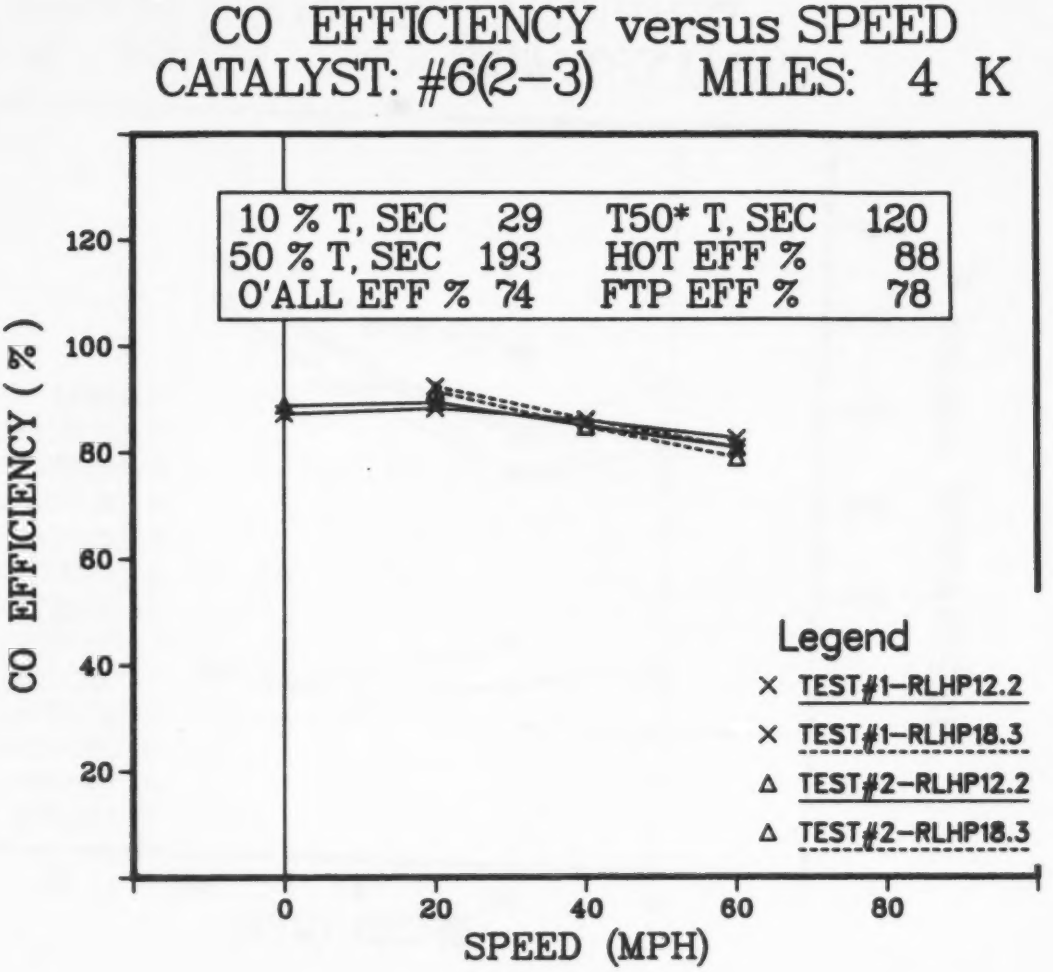


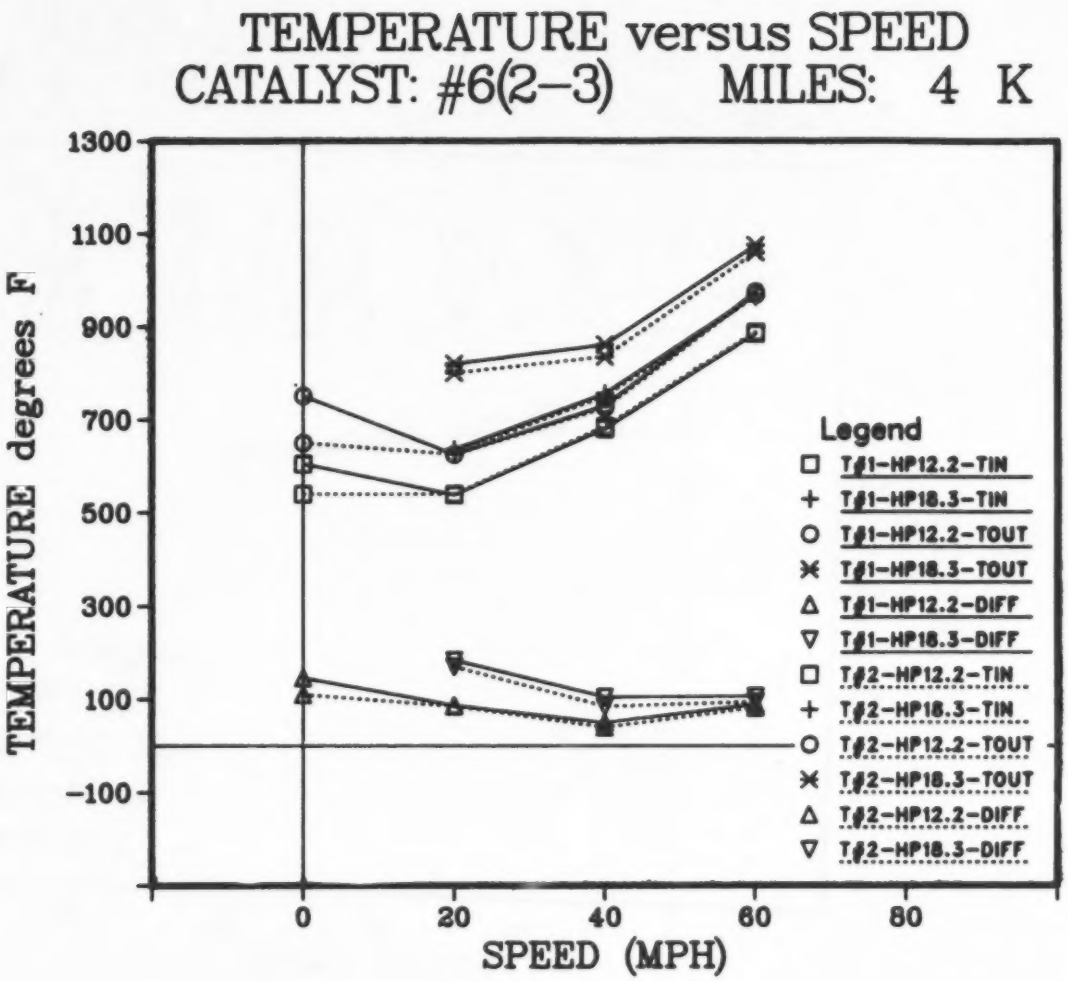

CO EFFICIENCY versus SPEED
CATALYST: #6(2-3) MILES: 0 K
10 % T, SEC 31
50 % T, SEC 156
O'ALL EFF % 84
T50* T, SEC 118
HOT EFF % 96
FTP EFF % 87
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1-RLHP12.2
TEST#1-RLHP18.3
TEST#2-RLHP12.2
TEST#2-RLHP18.3

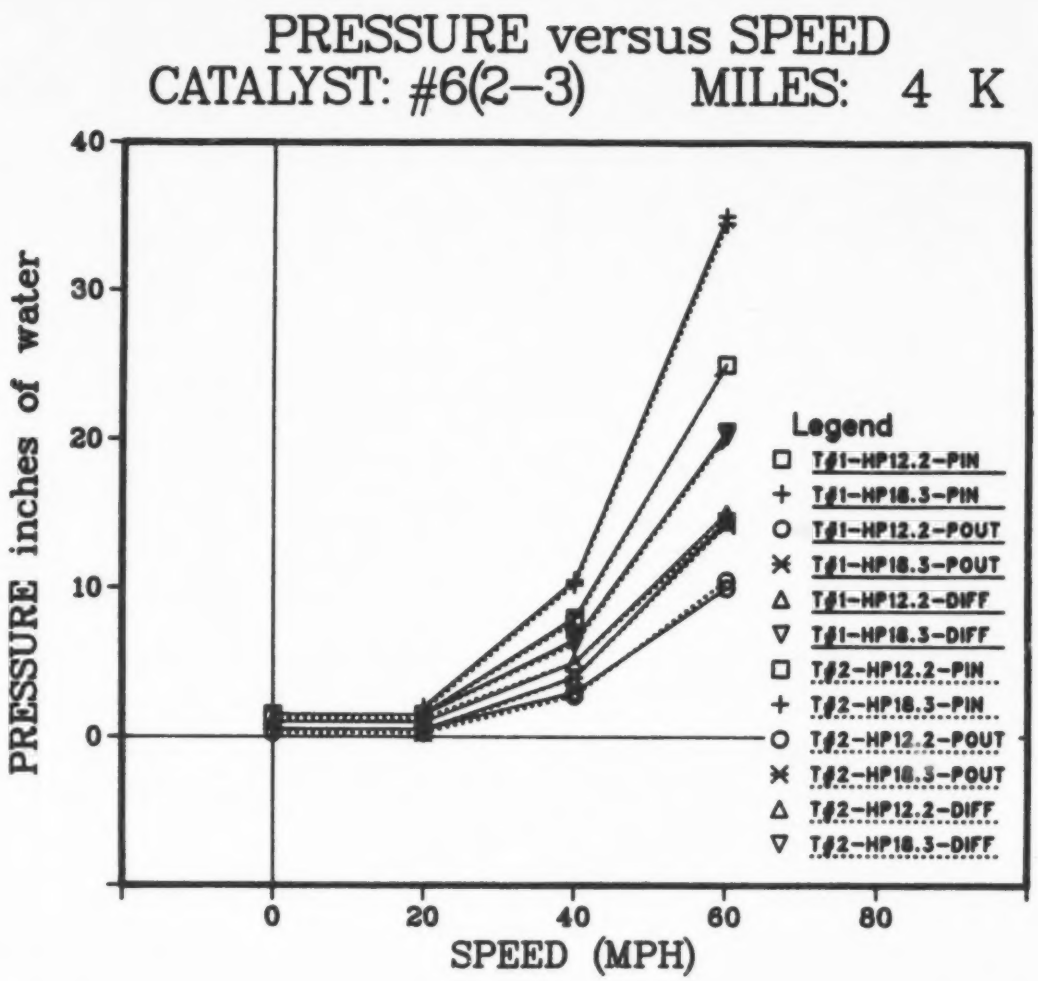

TEMPERATURE versus SPEED
CATALYST: #6(2-3) MILES: 0 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF


PRESSURE versus SPEED
CATALYST: #6(2–3) MILES: 0 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

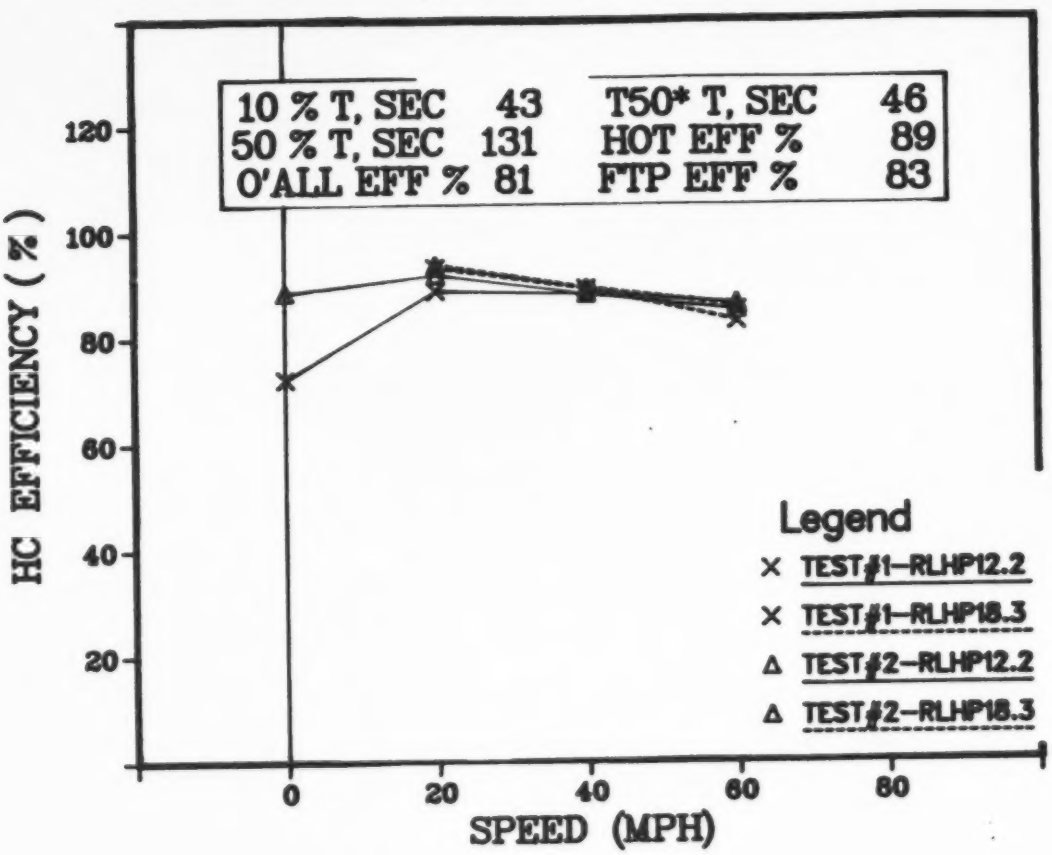

HC EFFICIENCY versus SPEED
CATALYST: #6(2–3) MILES: 4 K
10 % T, SEC 79
50 % T, SEC 405
O'ALL EFF % 61
T50* T, SEC 121
HOT EFF % 70
FTP EFF % 64
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3

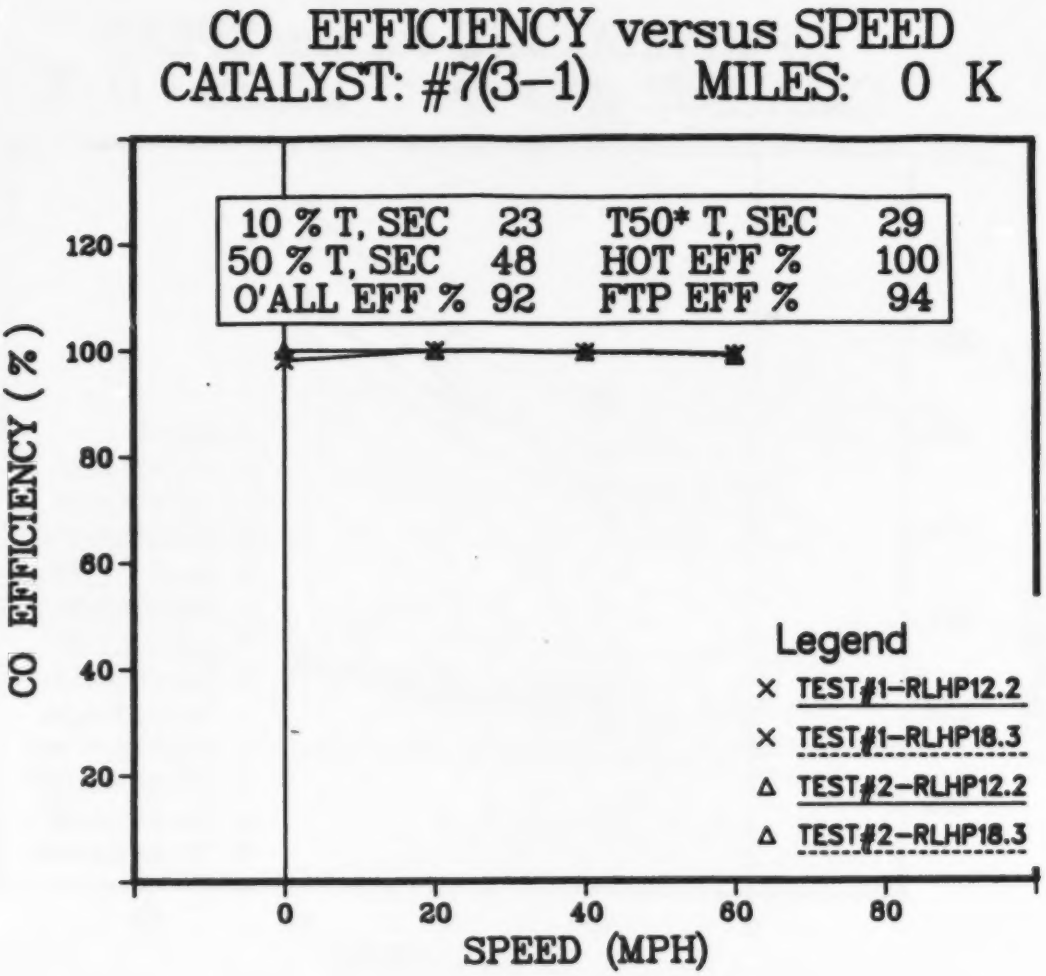

CO EFFICIENCY versus SPEED
CATALYST: #6(2-3) MILES: 4 K
10 % T, SEC 29
50 % T, SEC 193
O'ALL EFF % 74
T50* T, SEC 120
HOT EFF % 88
FTP EFF % 78
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1-RLHP12.2
× TEST#1-RLHP18.3
Δ TEST#2-RLHP12.2
Δ TEST#2-RLHP18.3

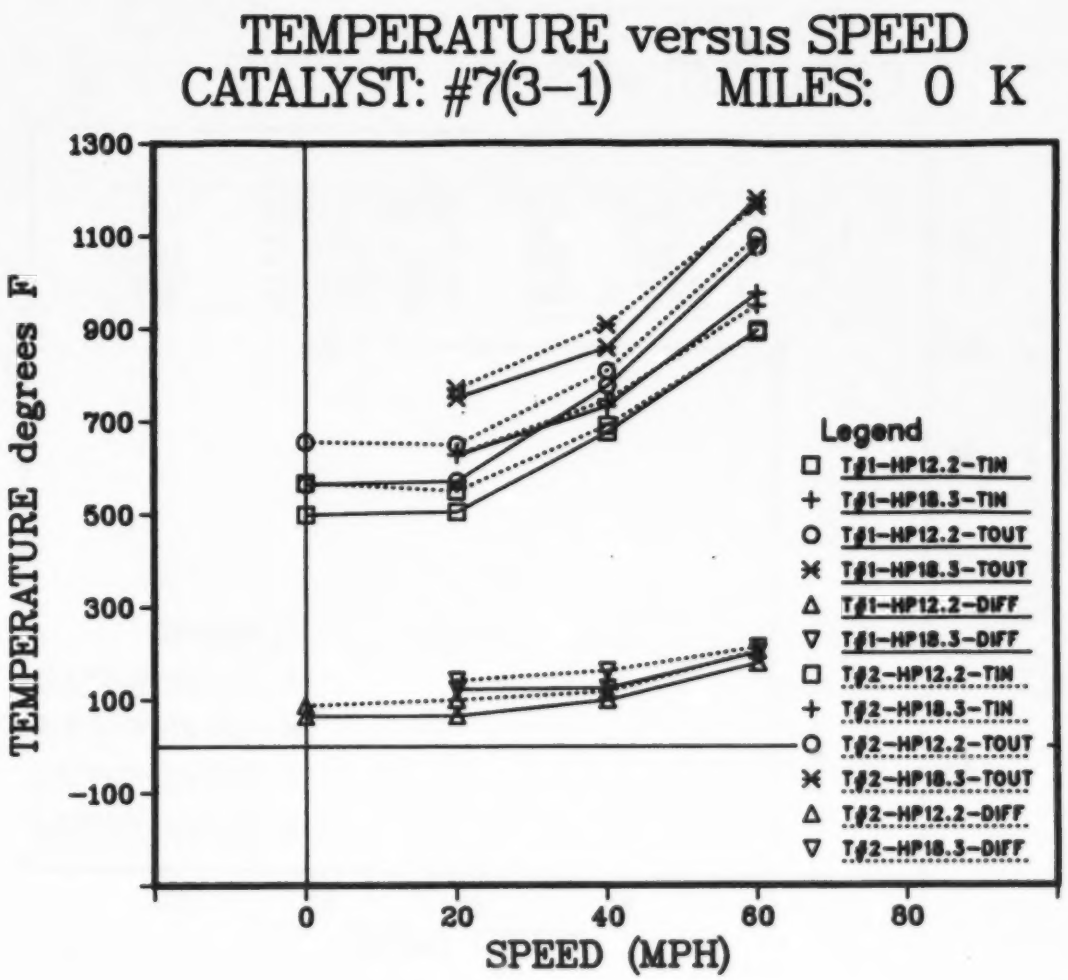

TEMPERATURE versus SPEED
CATALYST: #6(2–3) MILES: 4 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

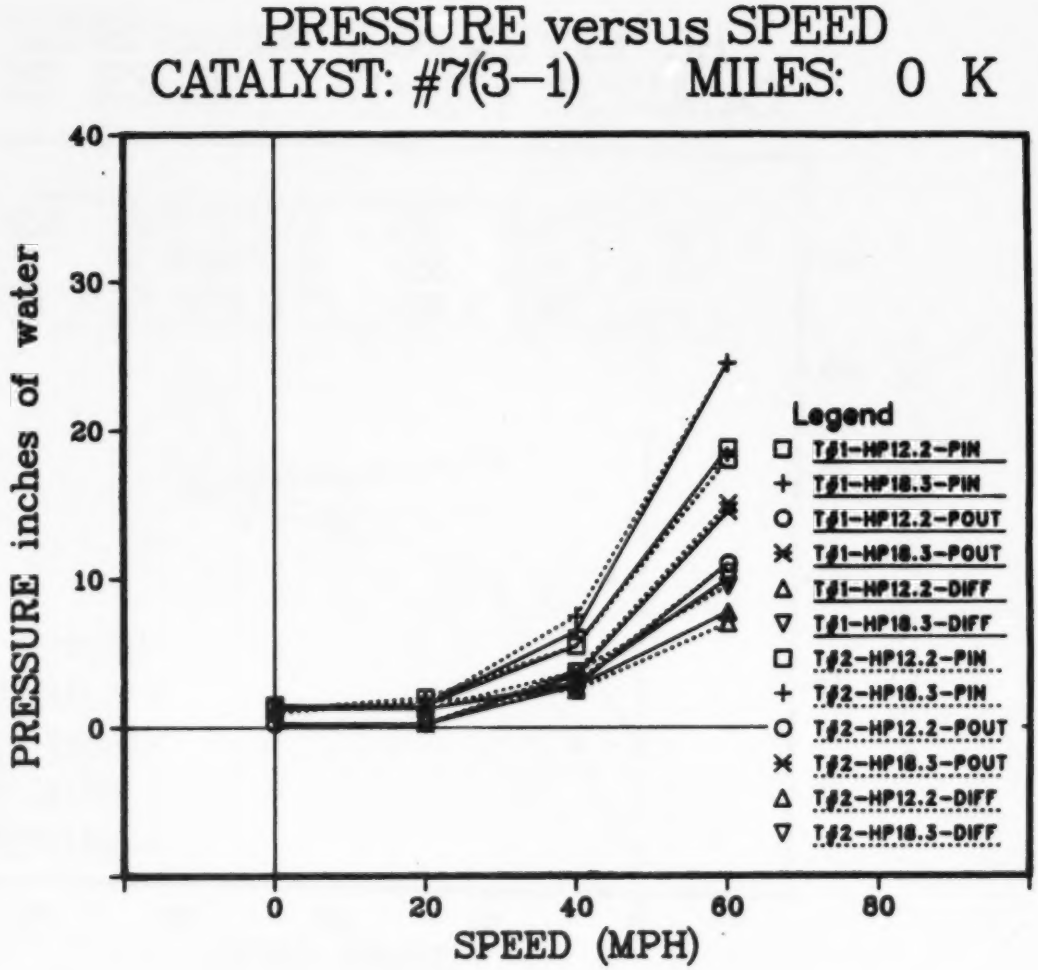

PRESSURE versus SPEED
CATALYST: #6(2-3) MILES: 4 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

HC EFFICIENCY versus SPEED
CATALYST: #7(3–1) MILES: 0 K

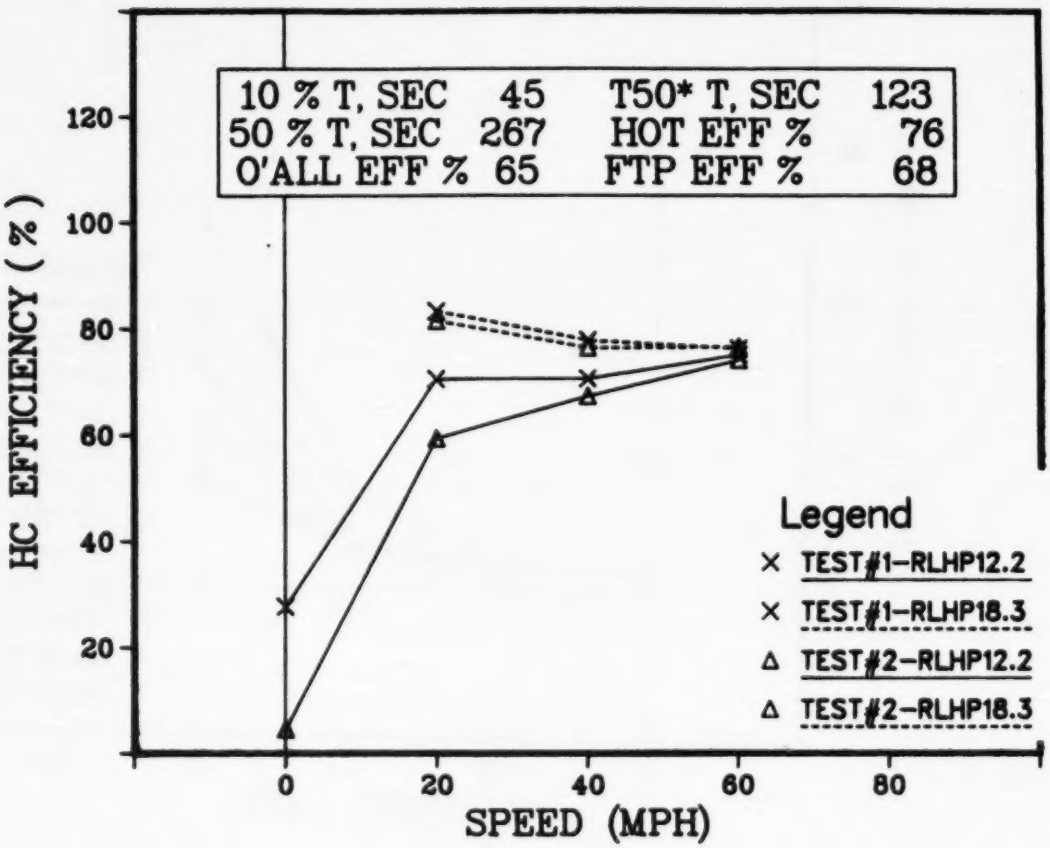


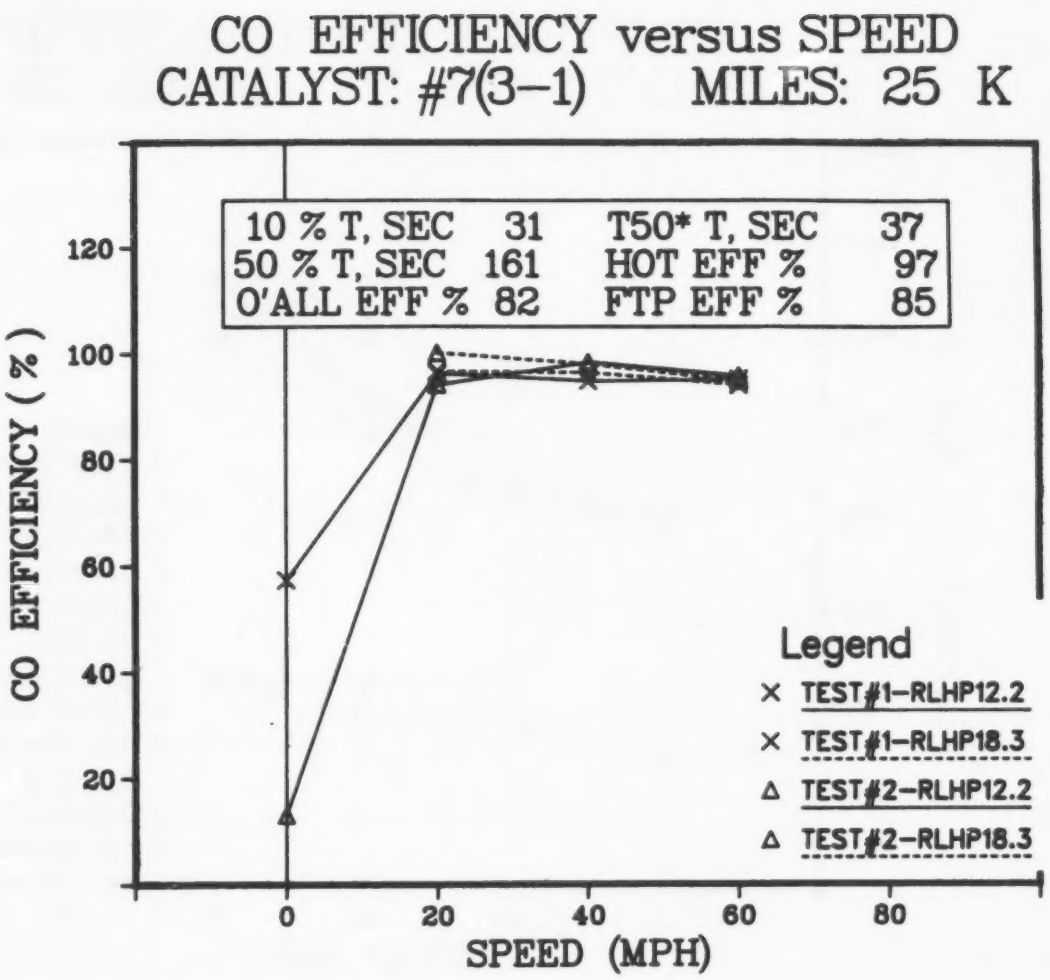

CO EFFICIENCY versus SPEED
CATALYST: #7(3–1) MILES: 0 K
10 % T, SEC 23
50 % T, SEC 48
O'ALL EFF % 92
T50* T, SEC 29
HOT EFF % 100
FTP EFF % 94
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3

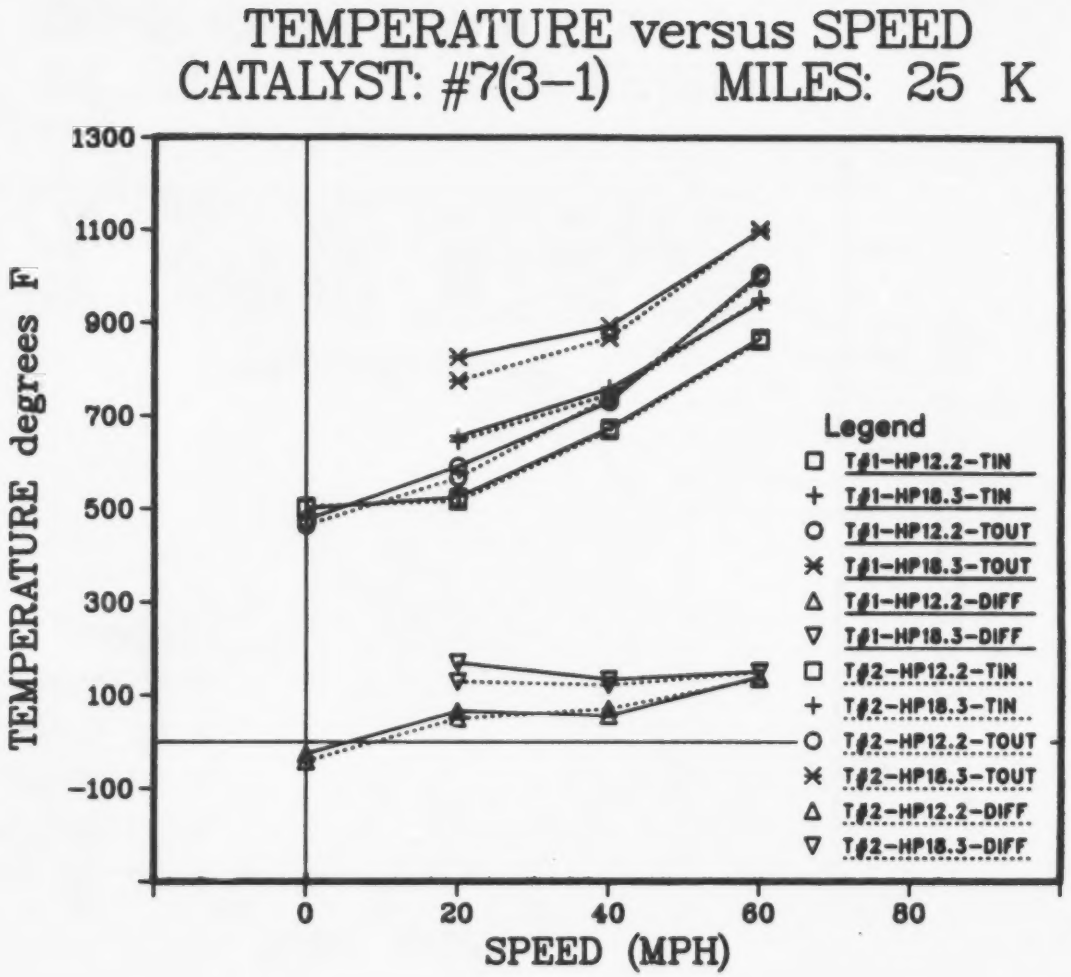

TEMPERATURE versus SPEED
CATALYST: #7(3–1) MILES: 0 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

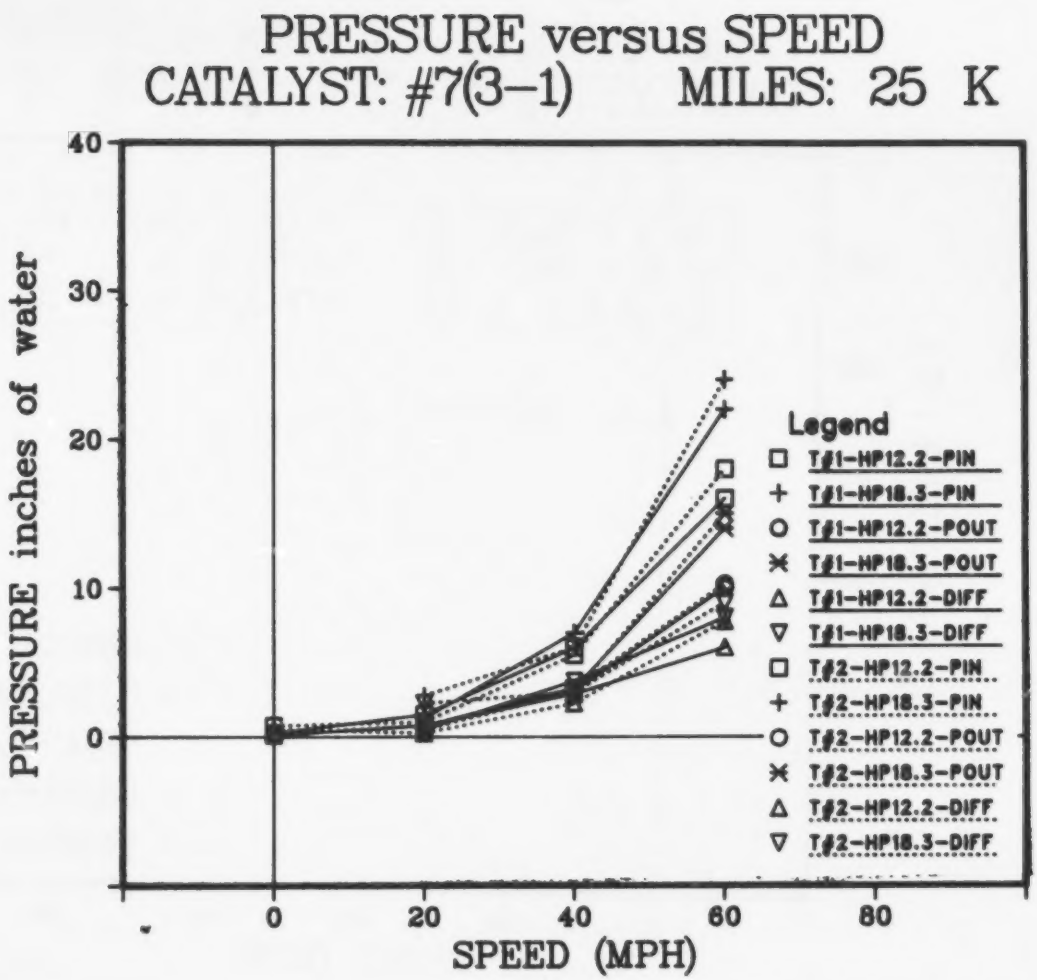

PRESSURE versus SPEED
CATALYST: #7(3–1) MILES: 0 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

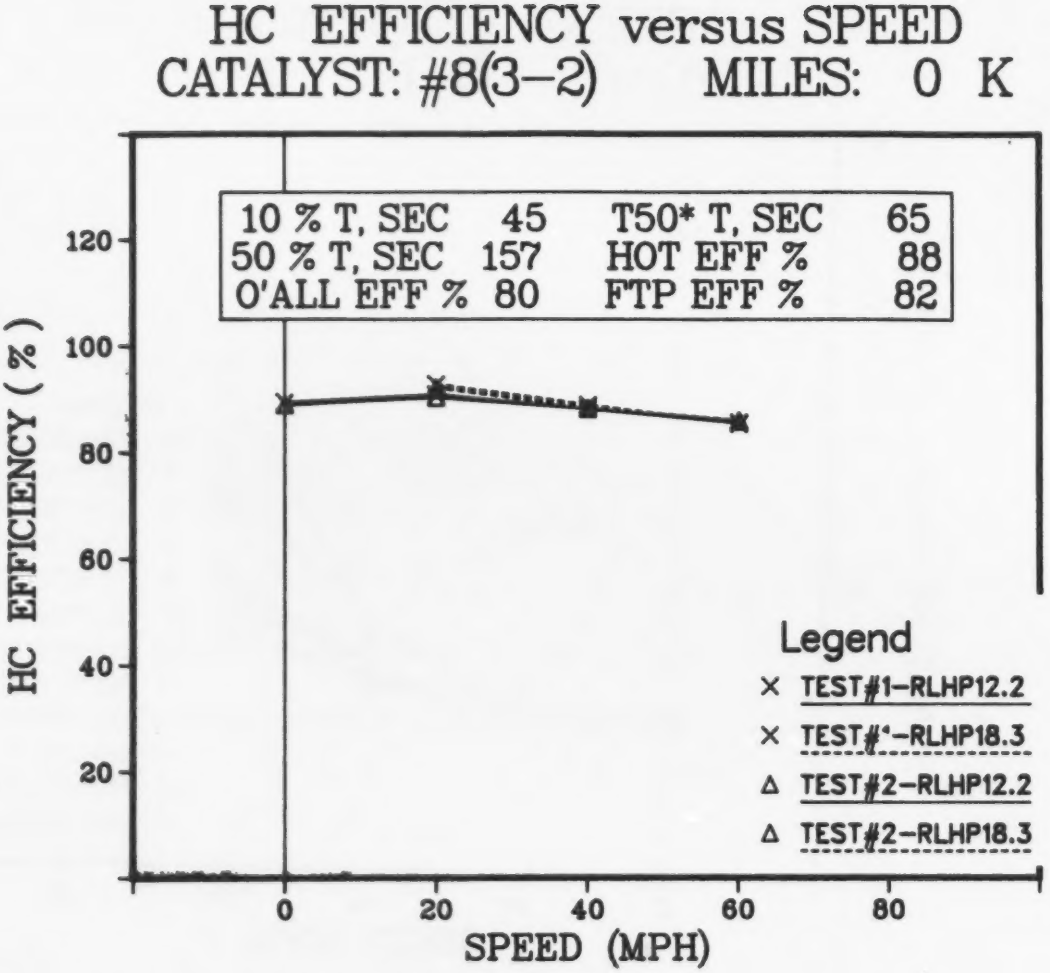
HC EFFICIENCY versus SPEED
CATALYST: #7(3–1) MILES: 25 K

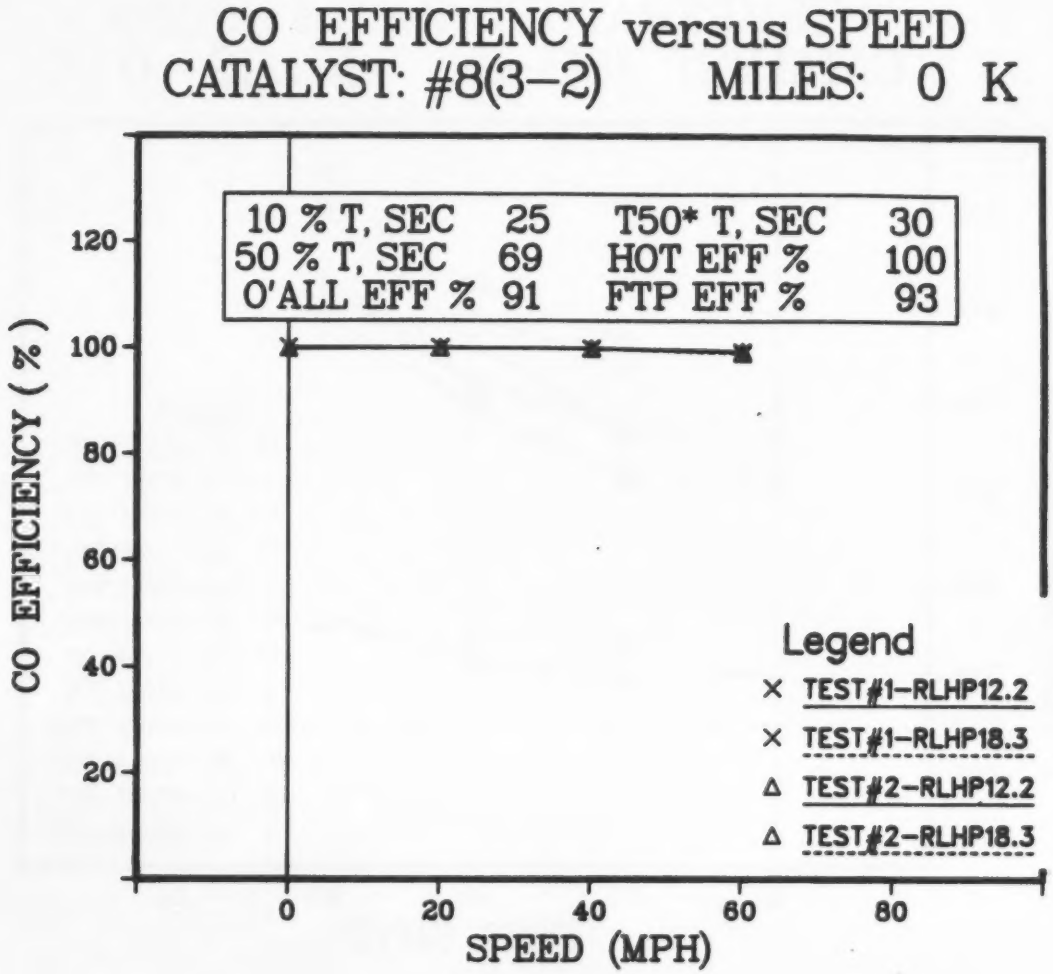


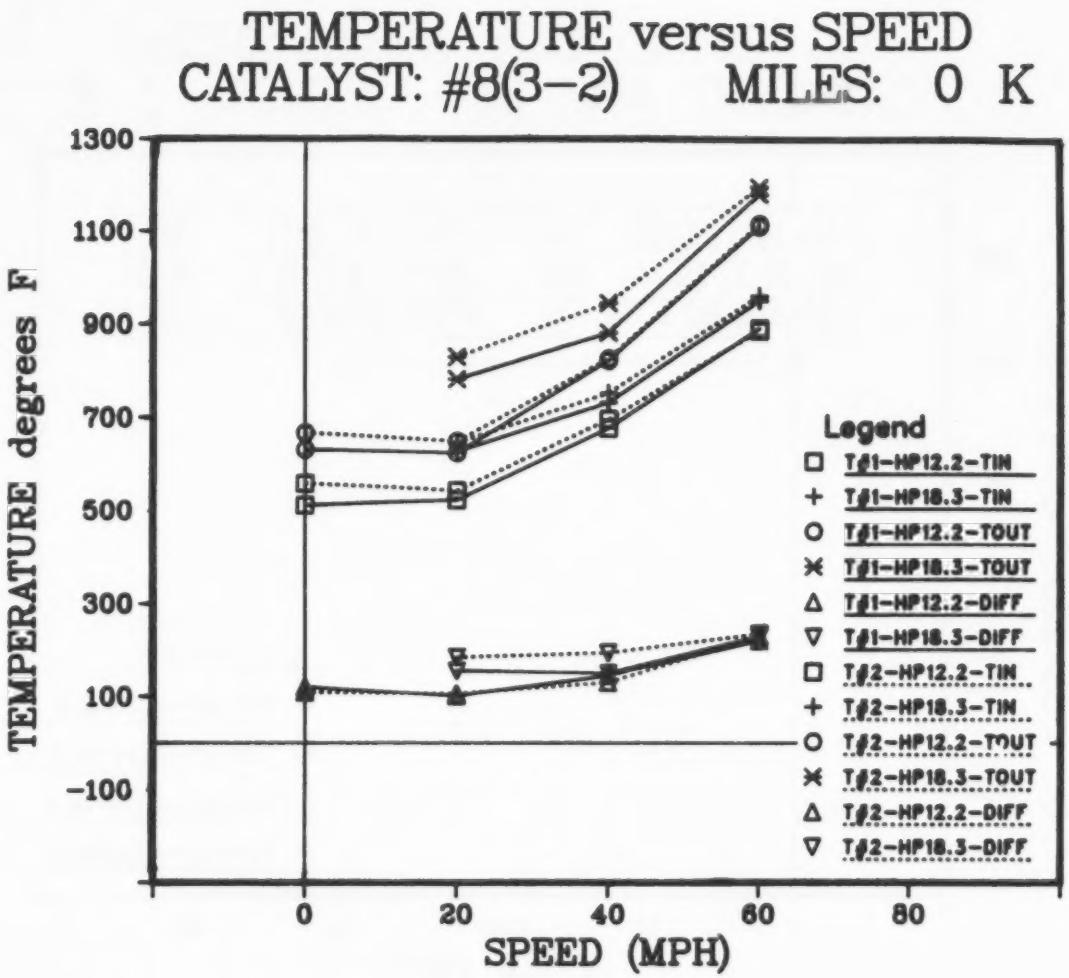

CO EFFICIENCY versus SPEED
CATALYST: #7(3–1) MILES: 25 K
10 % T, SEC 31
50 % T, SEC 161
O'ALL EFF % 82
T50* T, SEC 37
HOT EFF % 97
FTP EFF % 85
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3

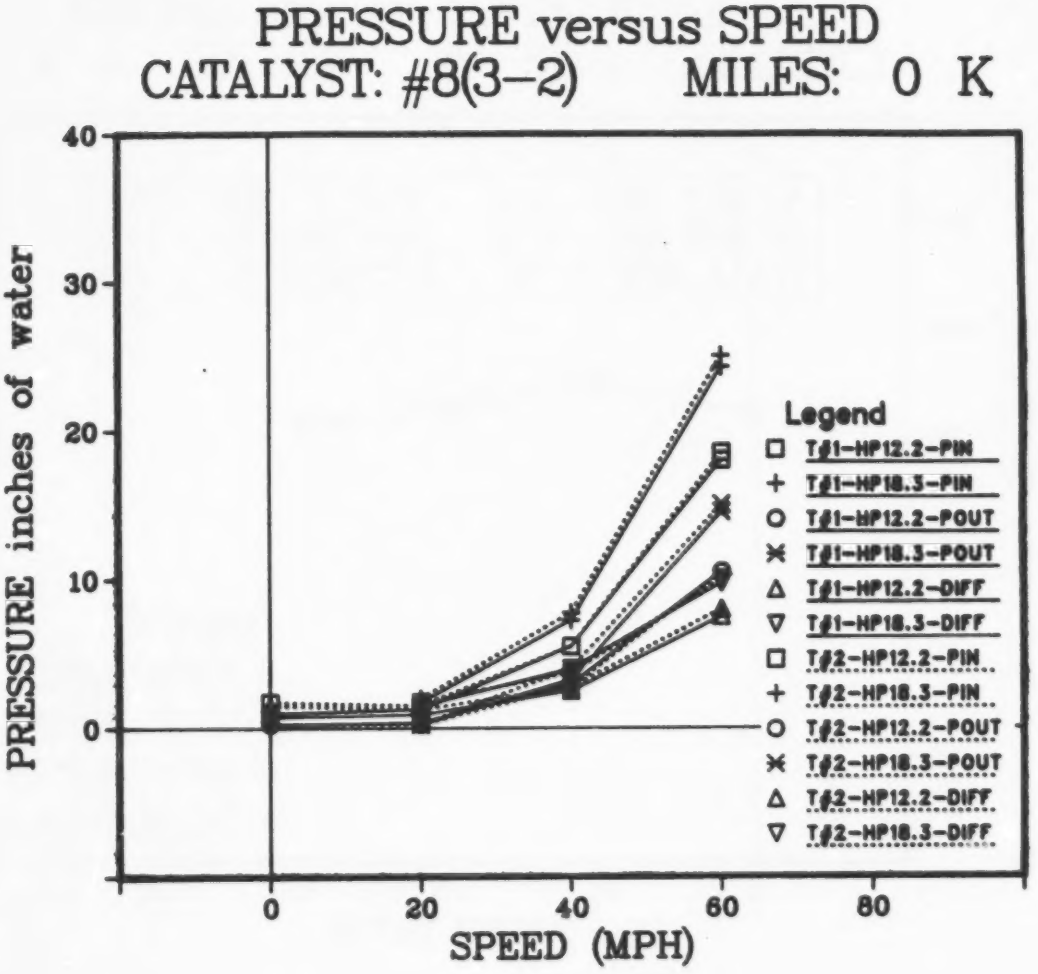

TEMPERATURE versus SPEED
CATALYST: #7(3–1) MILES: 25 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T∅1-HP12.2-TIN
T∅1-HP18.3-TIN
T∅1-HP12.2-TOUT
T∅1-HP18.3-TOUT
T∅1-HP12.2-DIFF
T∅1-HP18.3-DIFF
T∅2-HP12.2-TIN
T∅2-HP18.3-TIN
T∅2-HP12.2-TOUT
T∅2-HP18.3-TOUT
T∅2-HP12.2-DIFF
T∅2-HP18.3-DIFF

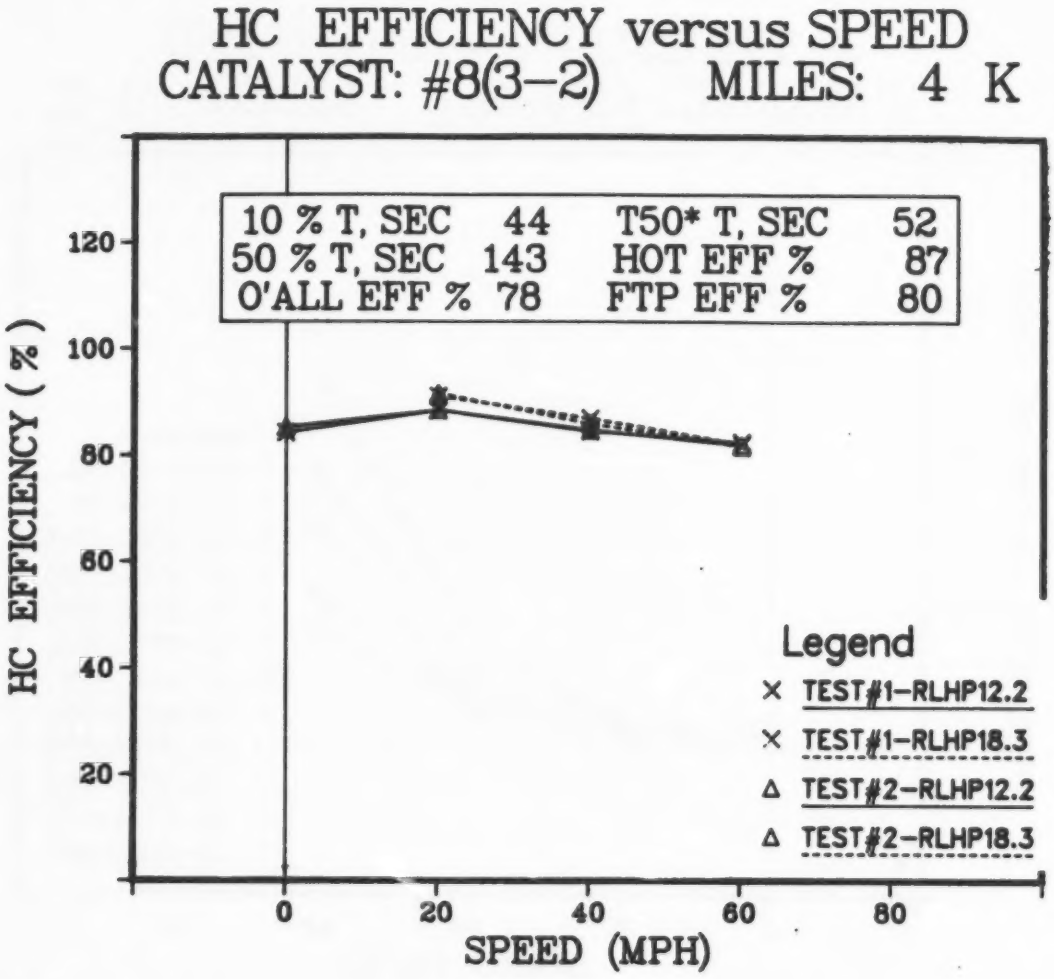

PRESSURE versus SPEED
CATALYST: #7(3–1) MILES: 25 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

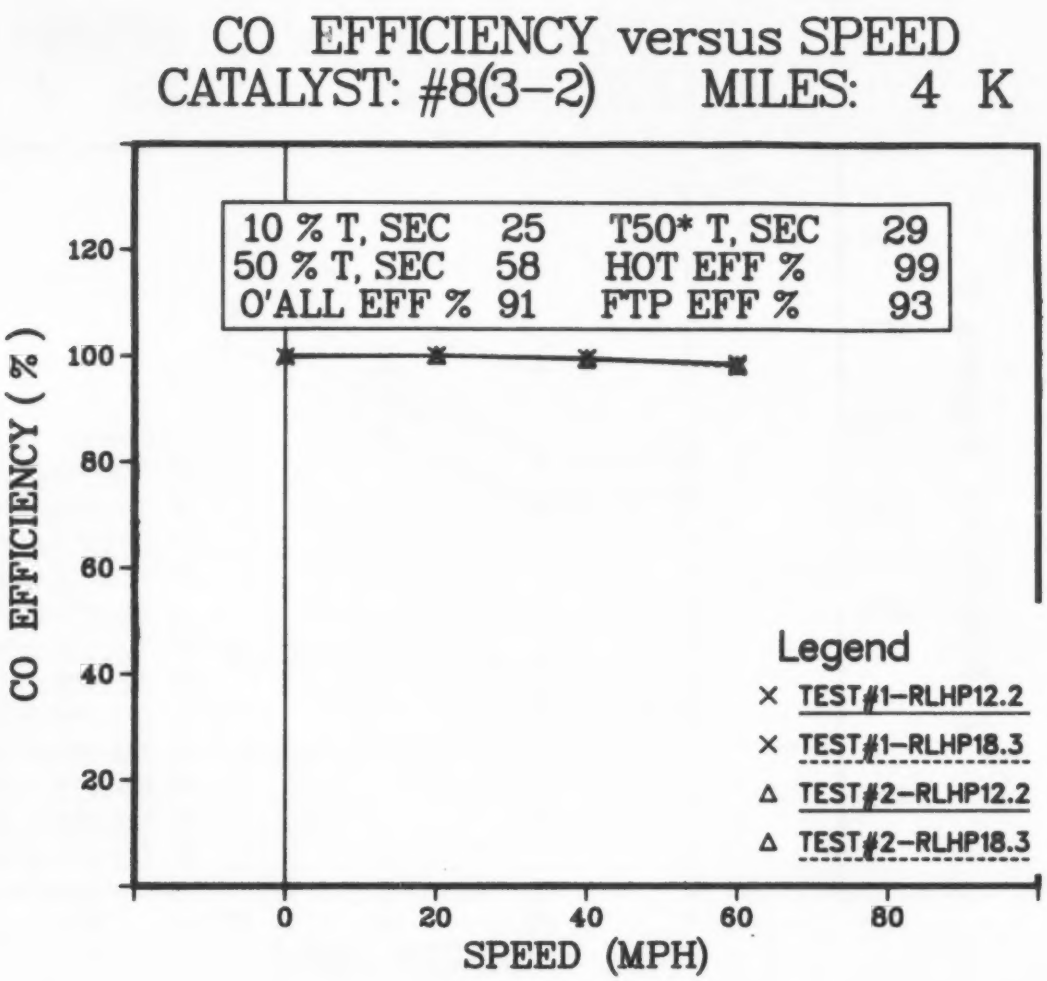

HC EFFICIENCY versus SPEED
CATALYST: #8(3–2) MILES: 0 K
10 % T, SEC 45
50 % T, SEC 157
O'ALL EFF % 80
T50* T, SEC 65
HOT EFF % 88
FTP EFF % 82
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1–RLHP12.2
× TEST#'–RLHP18.3
Δ TEST#2–RLHP12.2
Δ TEST#2–RLHP18.3

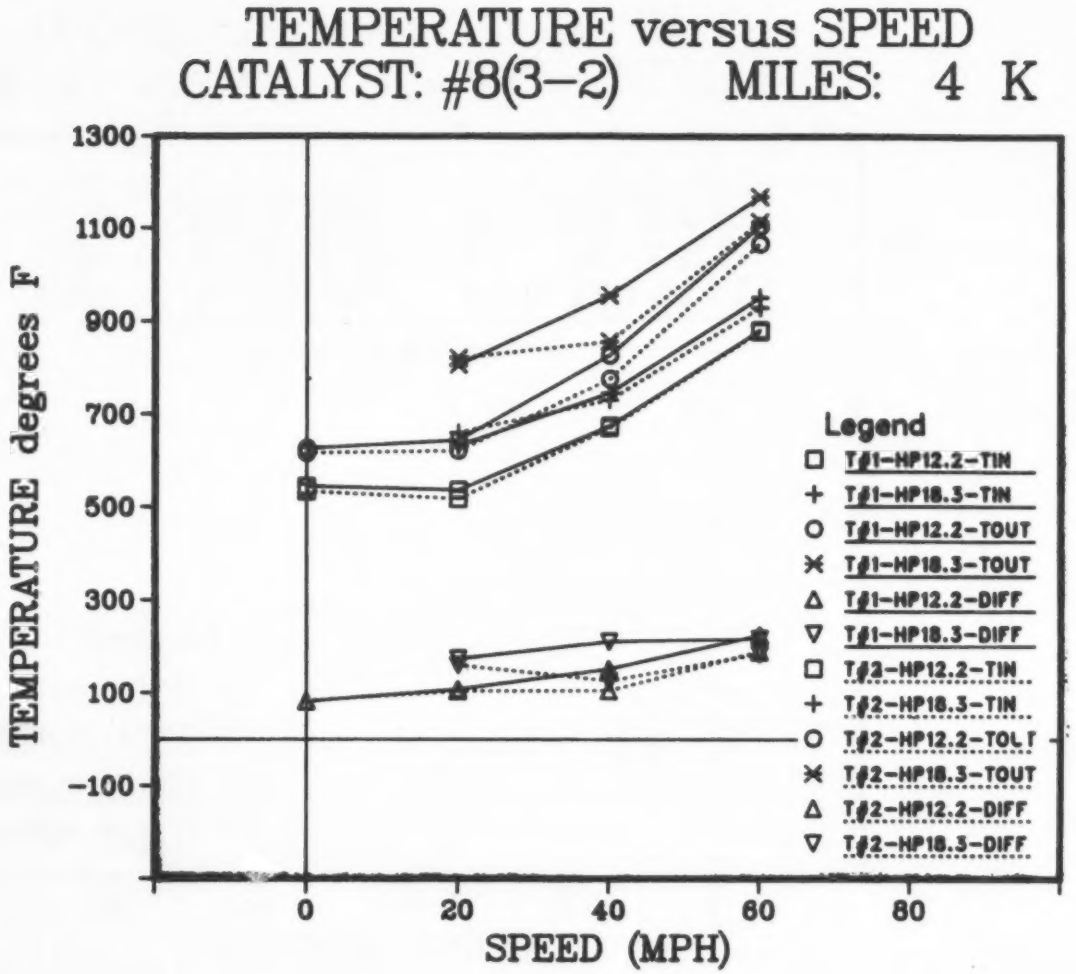

CO EFFICIENCY versus SPEED
CATALYST: #8(3–2) MILES: 0 K
10 % T, SEC 25
50 % T, SEC 69
O'ALL EFF % 91
T50* T, SEC 30
HOT EFF % 100
FTP EFF % 93
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1–RLHP12.2
× TEST#1–RLHP18.3
Δ TEST#2–RLHP12.2
Δ TEST#2–RLHP18.3

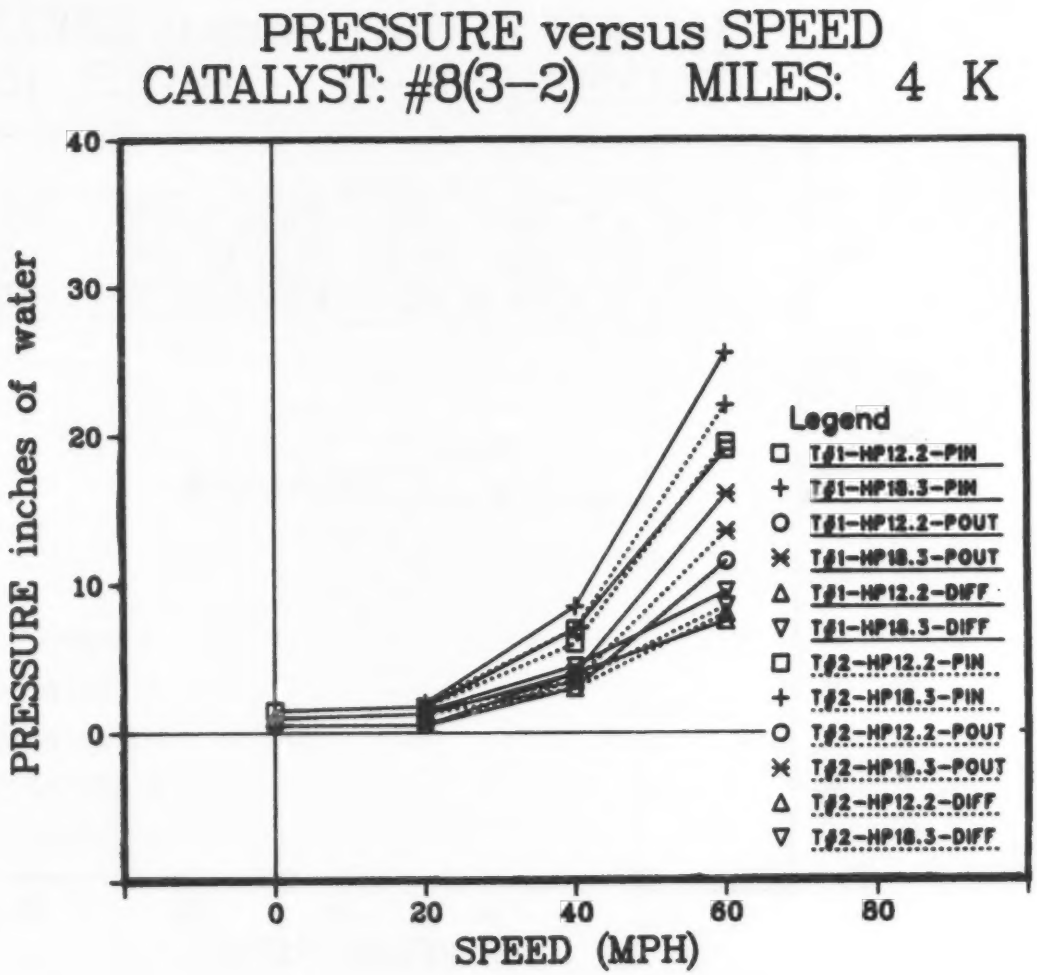

TEMPERATURE versus SPEED
CATALYST: #8(3–2) MILES: 0 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

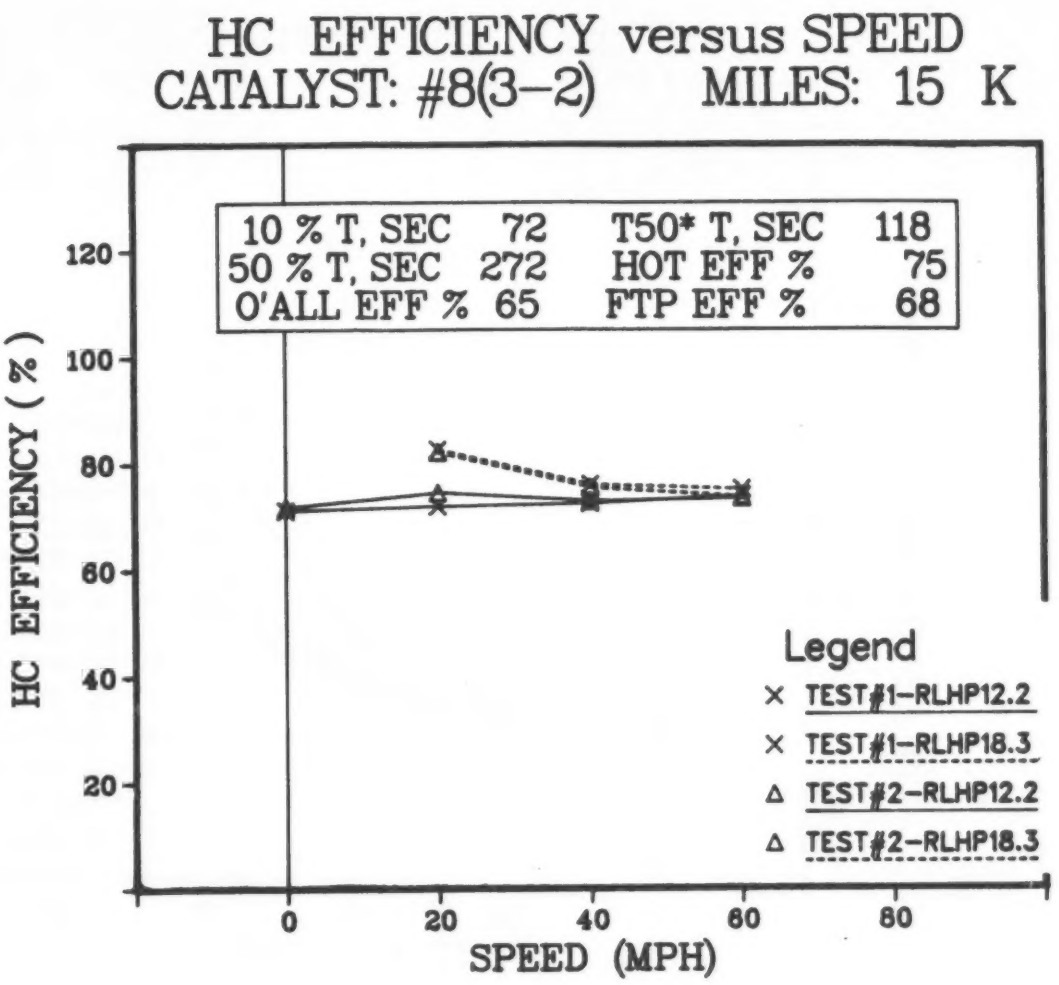

PRESSURE versus SPEED
CATALYST: #8(3-2) MILES: 0 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF


HC EFFICIENCY versus SPEED
CATALYST: #8(3–2) MILES: 4 K
10 % T, SEC 44
50 % T, SEC 143
O'ALL EFF % 78
T50* T, SEC 52
HOT EFF % 87
FTP EFF % 80
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1–RLHP12.2
× TEST#1–RLHP18.3
Δ TEST#2–RLHP12.2
Δ TEST#2–RLHP18.3

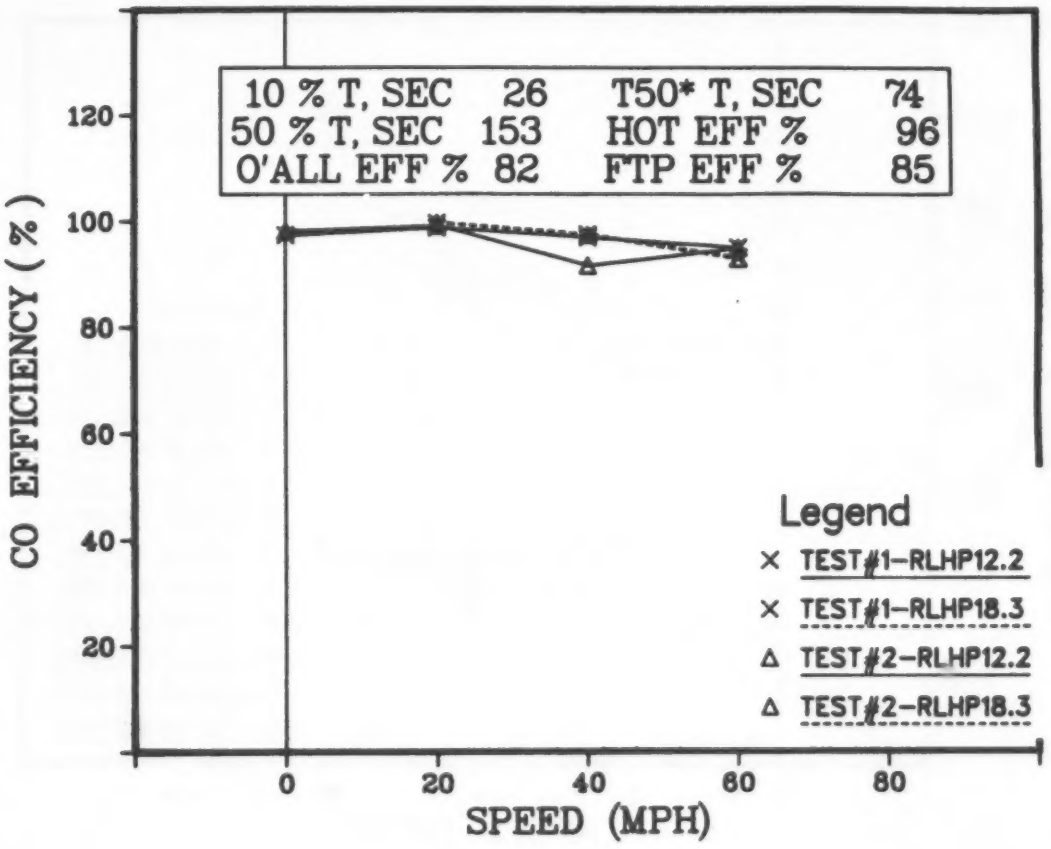

CO EFFICIENCY versus SPEED
CATALYST: #8(3-2) MILES: 4 K
10 % T, SEC 25
50 % T, SEC 58
O'ALL EFF % 91
T50* T, SEC 29
HOT EFF % 99
FTP EFF % 93
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1-RLHP12.2
TEST#1-RLHP18.3
TEST#2-RLHP12.2
TEST#2-RLHP18.3

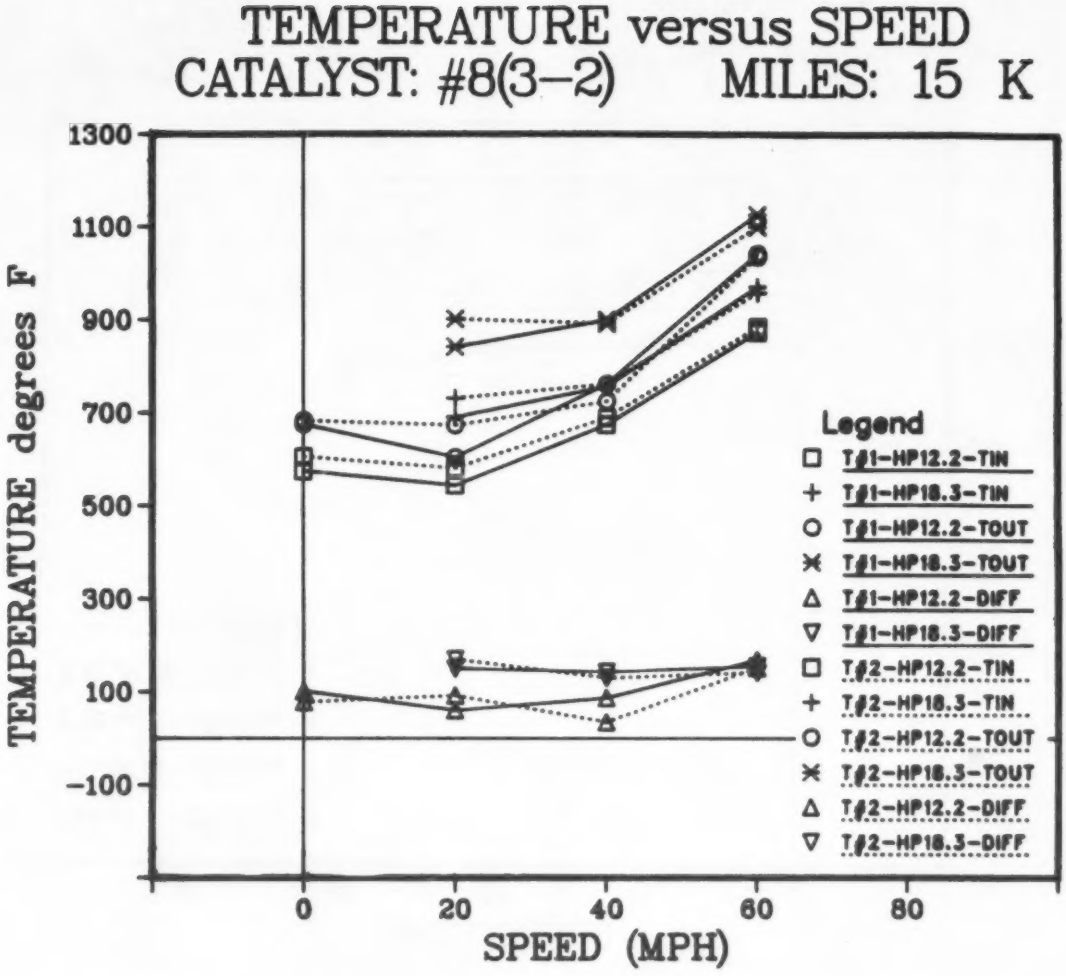

TEMPERATURE versus SPEED
CATALYST: #8(3–2) MILES: 4 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

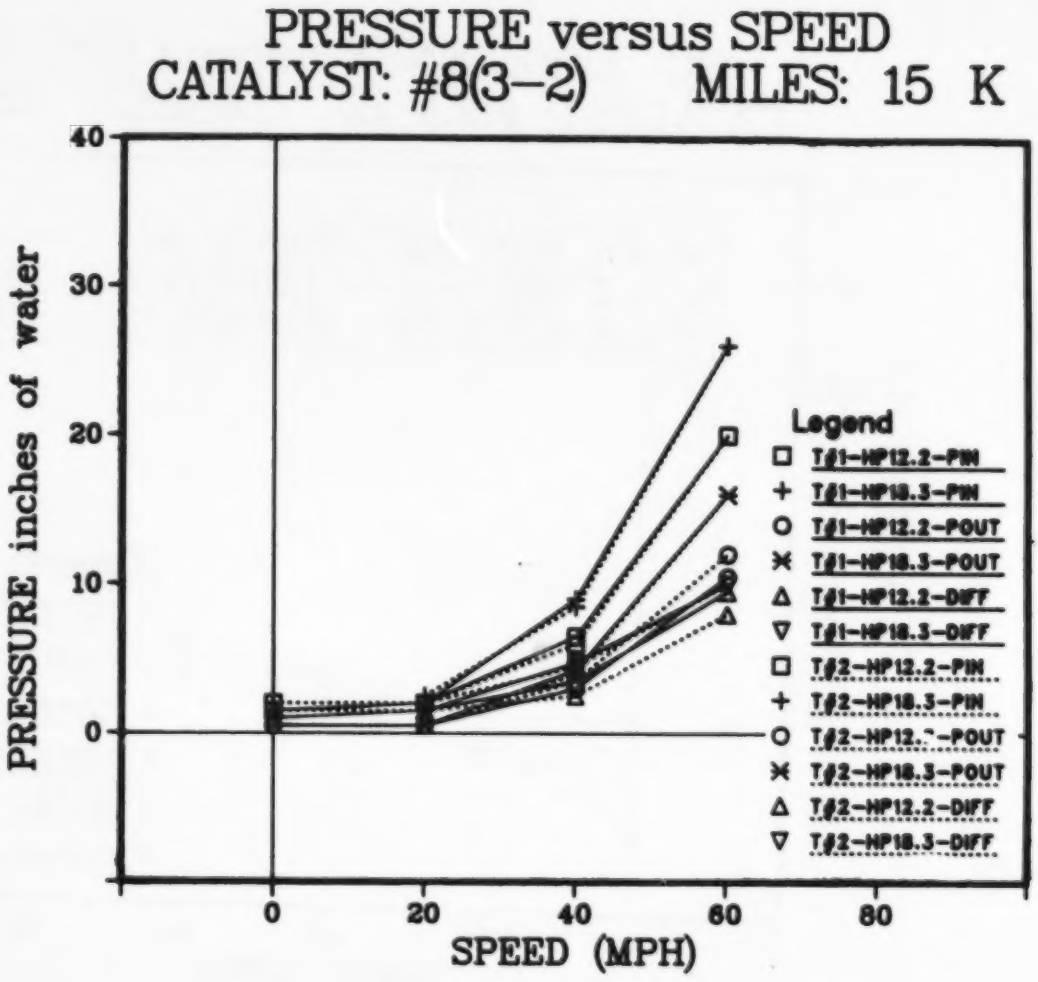

PRESSURE versus SPEED
CATALYST: #8(3-2) MILES: 4 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF


HC EFFICIENCY versus SPEED
CATALYST: #8(3–2) MILES: 15 K
10 % T, SEC 72
50 % T, SEC 272
O'ALL EFF % 65
T50* T, SEC 118
HOT EFF % 75
FTP EFF % 68
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1–RLHP12.2
× TEST#1–RLHP18.3
△ TEST#2–RLHP12.2
△ TEST#2–RLHP18.3

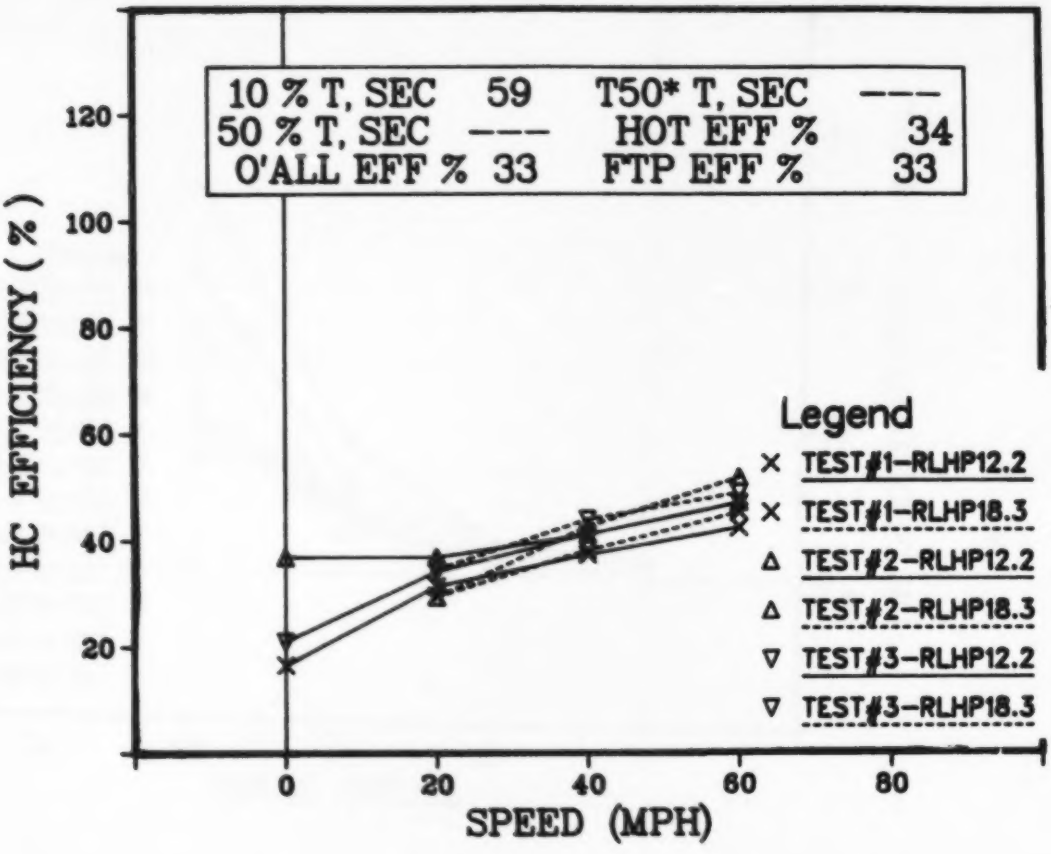
CO EFFICIENCY versus SPEED
CATALYST: #8(3-2) MILES: 15 K

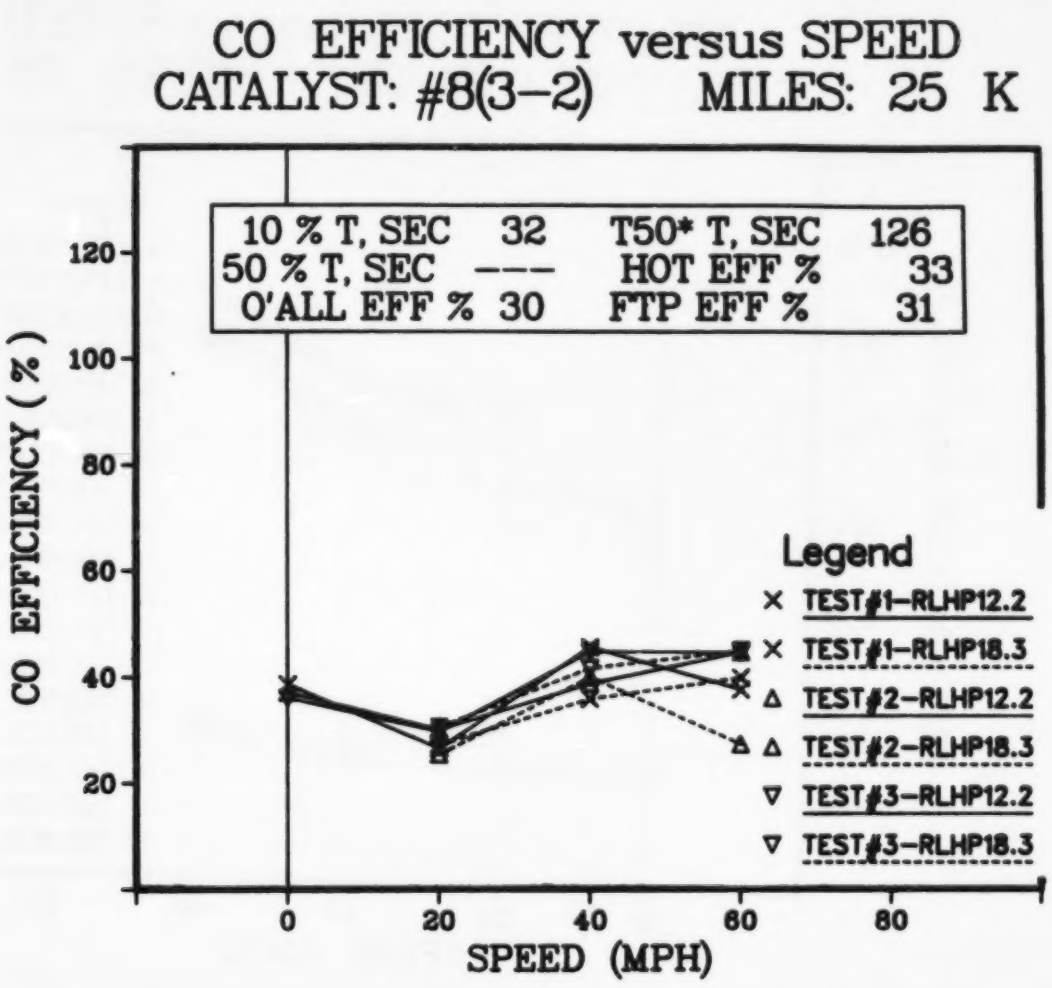



TEMPERATURE versus SPEED
CATALYST: #8(3–2) MILES: 15 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

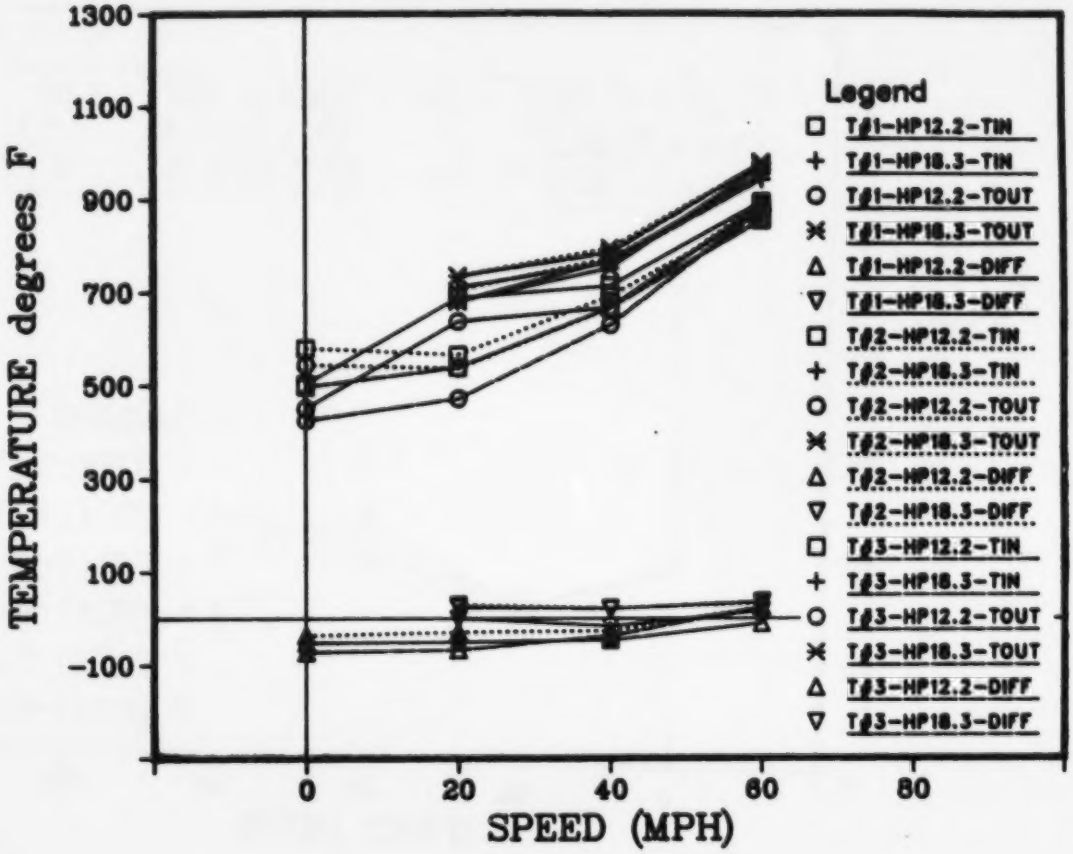

PRESSURE versus SPEED
CATALYST: #8(3–2) MILES: 15 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

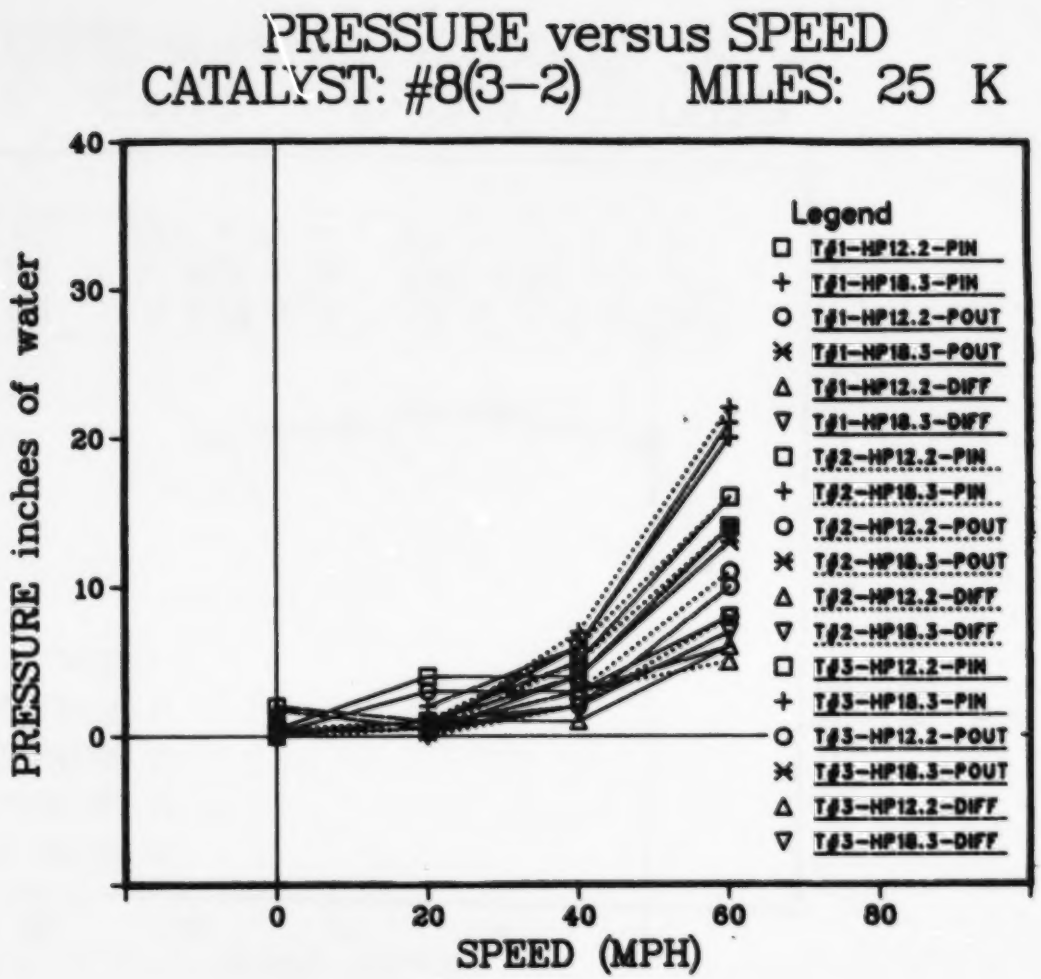
HC EFFICIENCY versus SPEED
CATALYST: #8(3–2) MILES: 25 K

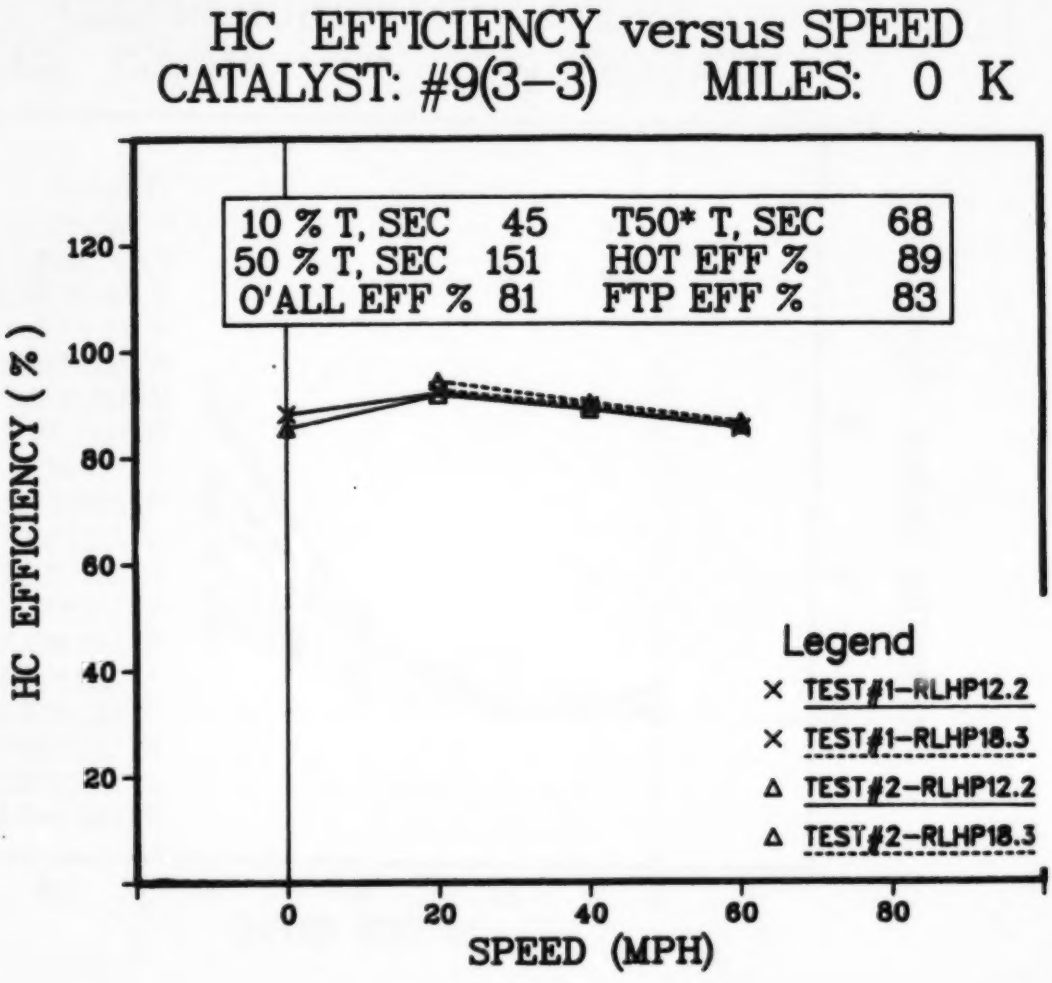


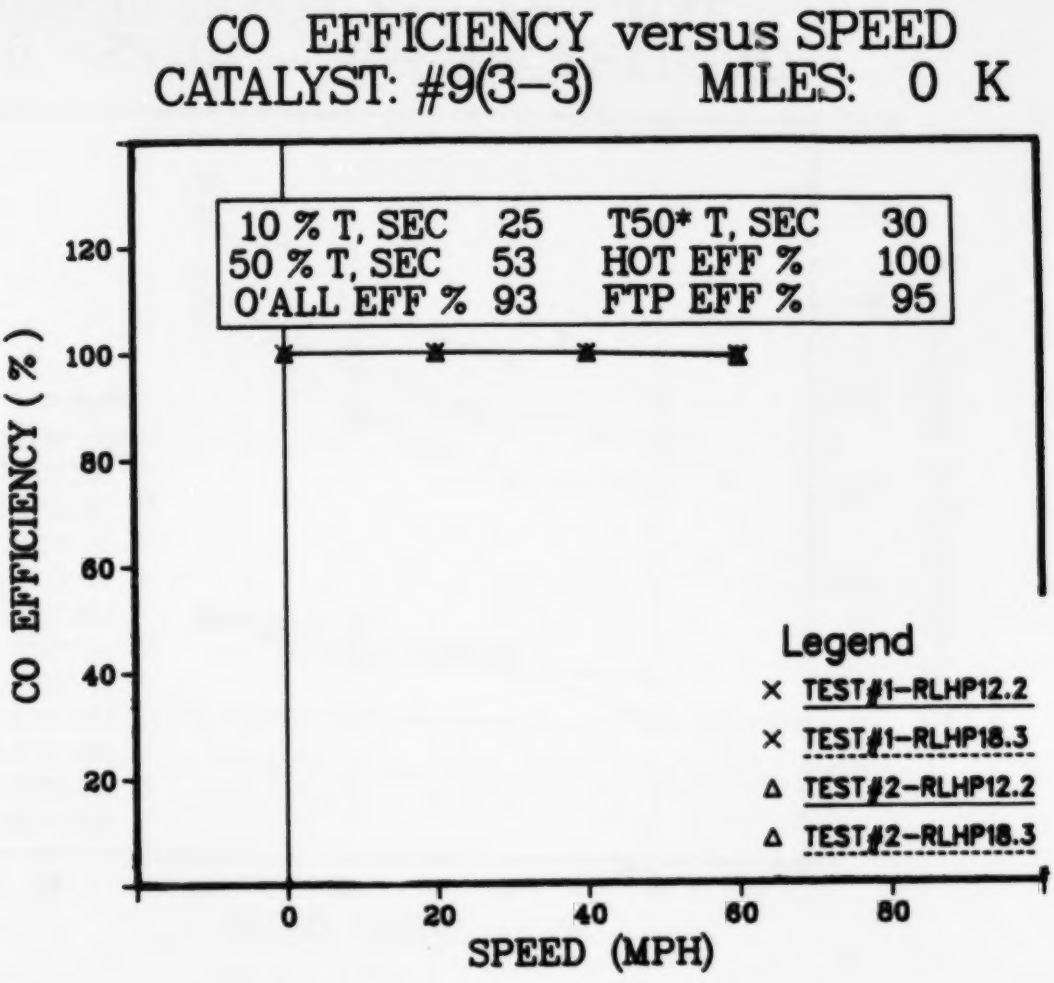

CO EFFICIENCY versus SPEED
CATALYST: #8(3-2) MILES: 25 K
10 % T, SEC 32
50 % T, SEC ---
O'ALL EFF % 30
T50* T, SEC 126
HOT EFF % 33
FTP EFF % 31
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1-RLHP12.2
TEST#1-RLHP18.3
TEST#2-RLHP12.2
TEST#2-RLHP18.3
TEST#3-RLHP12.2
TEST#3-RLHP18.3

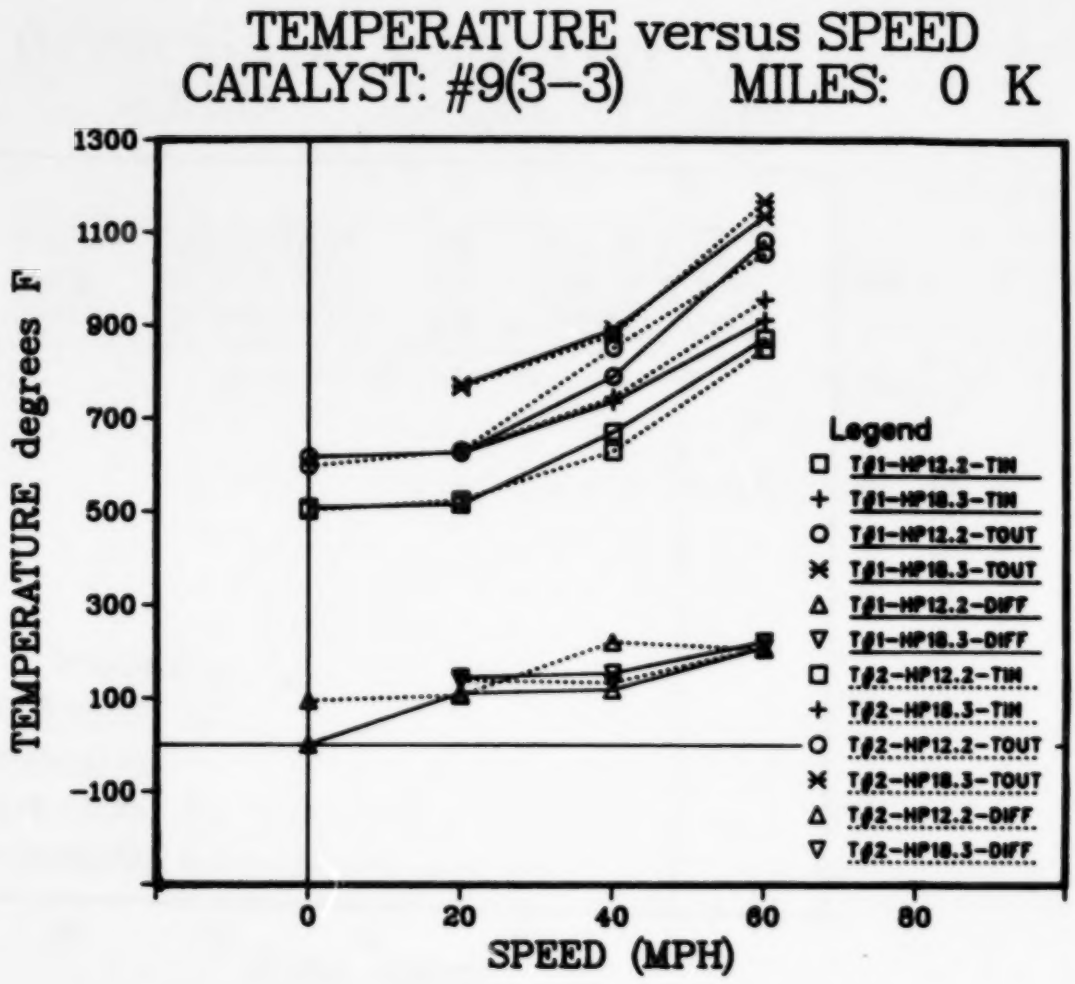
TEMPERATURE versus SPEED
CATALYST: #8(3–2) MILES: 25 K

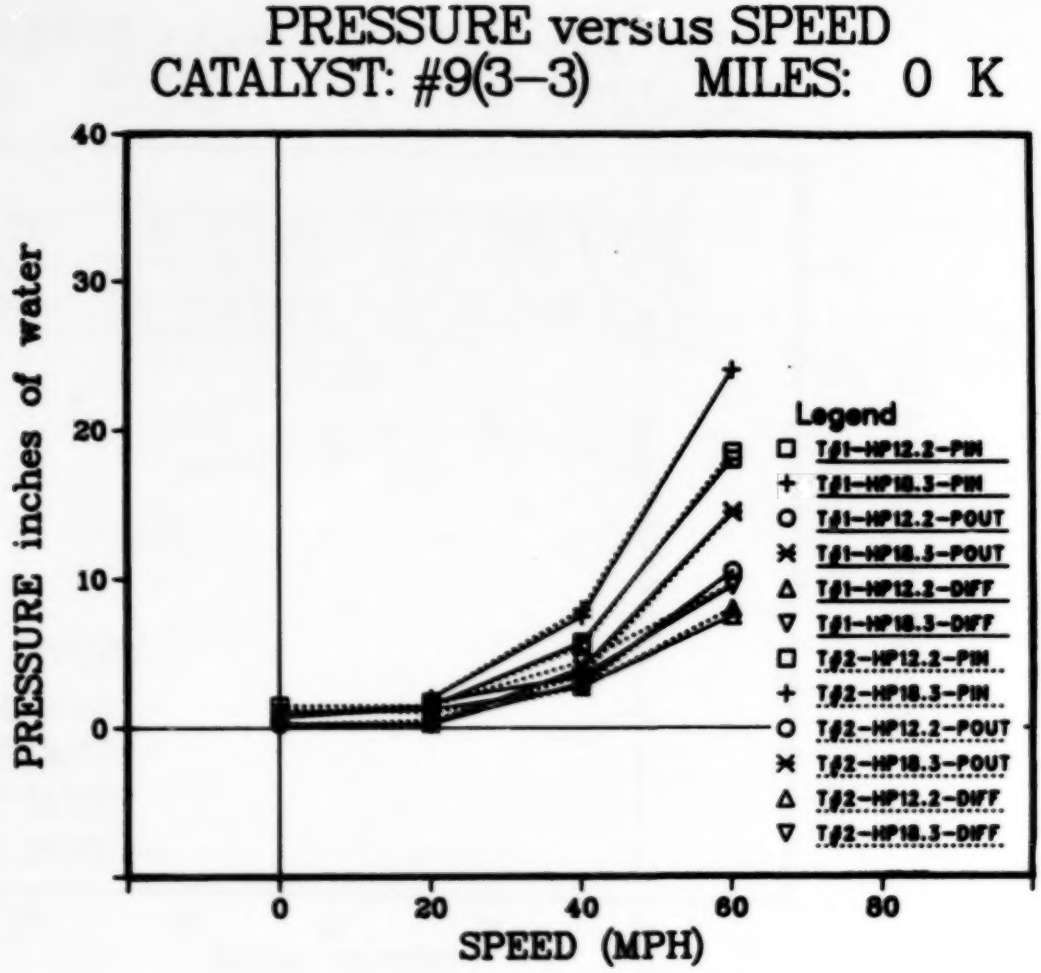


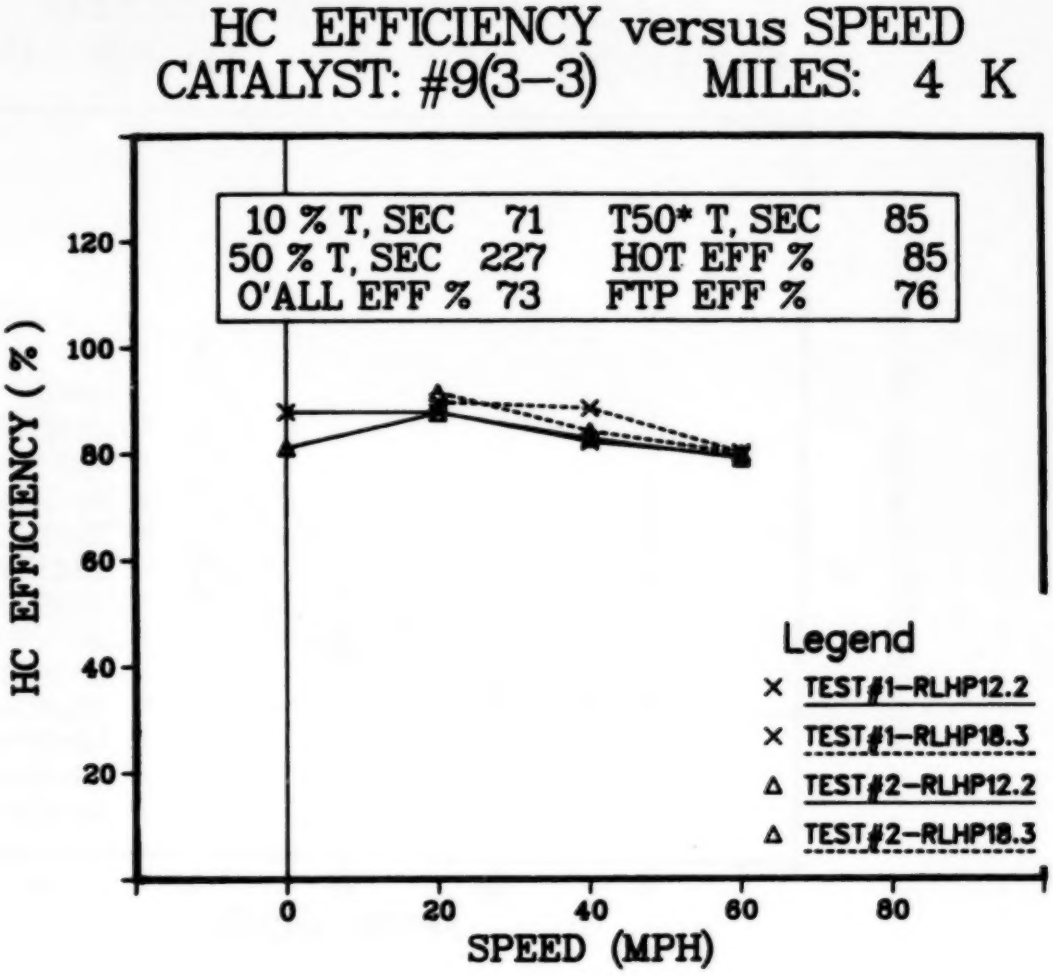

PRESSURE versus SPEED
CATALYST: #8(3-2) MILES: 25 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF
T#3-HP12.2-PIN
T#3-HP18.3-PIN
T#3-HP12.2-POUT
T#3-HP18.3-POUT
T#3-HP12.2-DIFF
T#3-HP18.3-DIFF

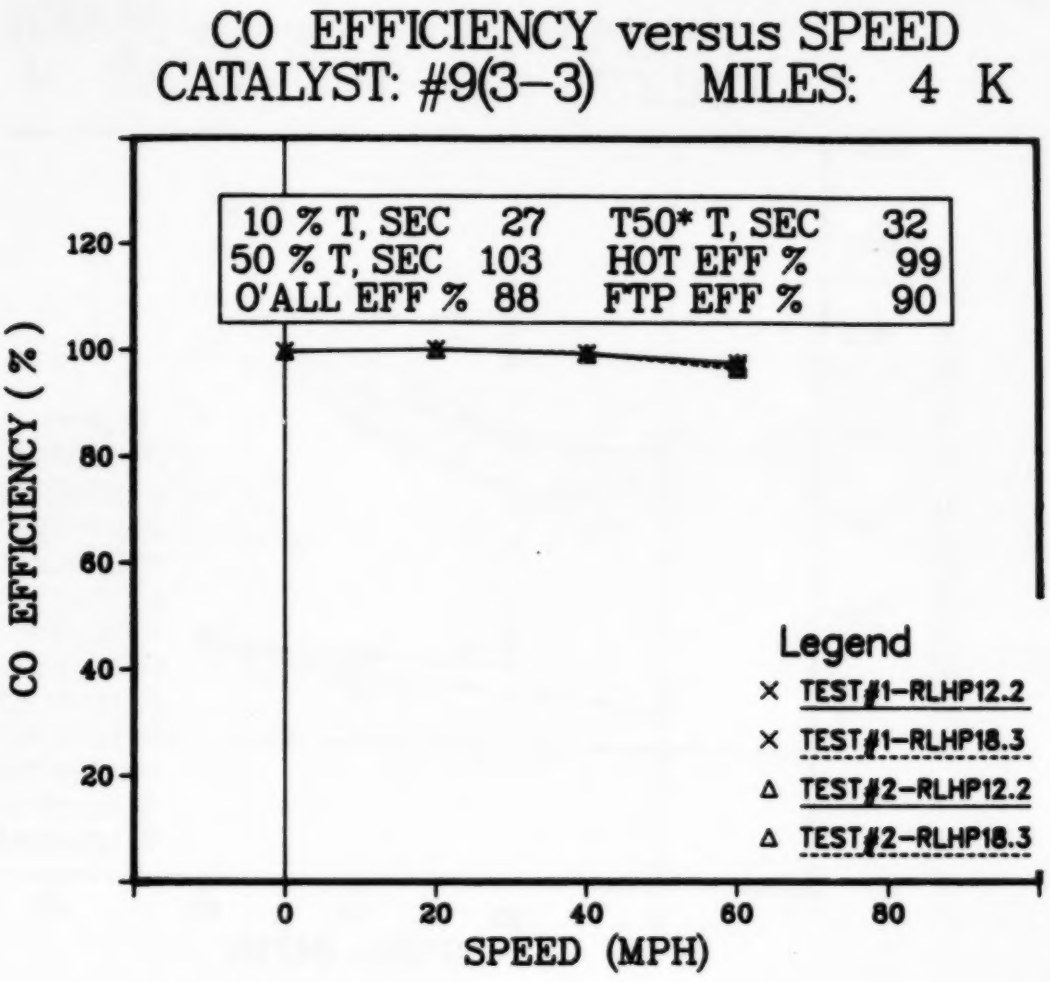

HC EFFICIENCY versus SPEED
CATALYST: #9(3–3) MILES: 0 K
10 % T, SEC 45
T50* T, SEC 68
50 % T, SEC 151
HOT EFF % 89
O'ALL EFF % 81
FTP EFF % 83
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1–RLHP12.2
× TEST#1–RLHP18.3
△ TEST#2–RLHP12.2
△ TEST#2–RLHP18.3

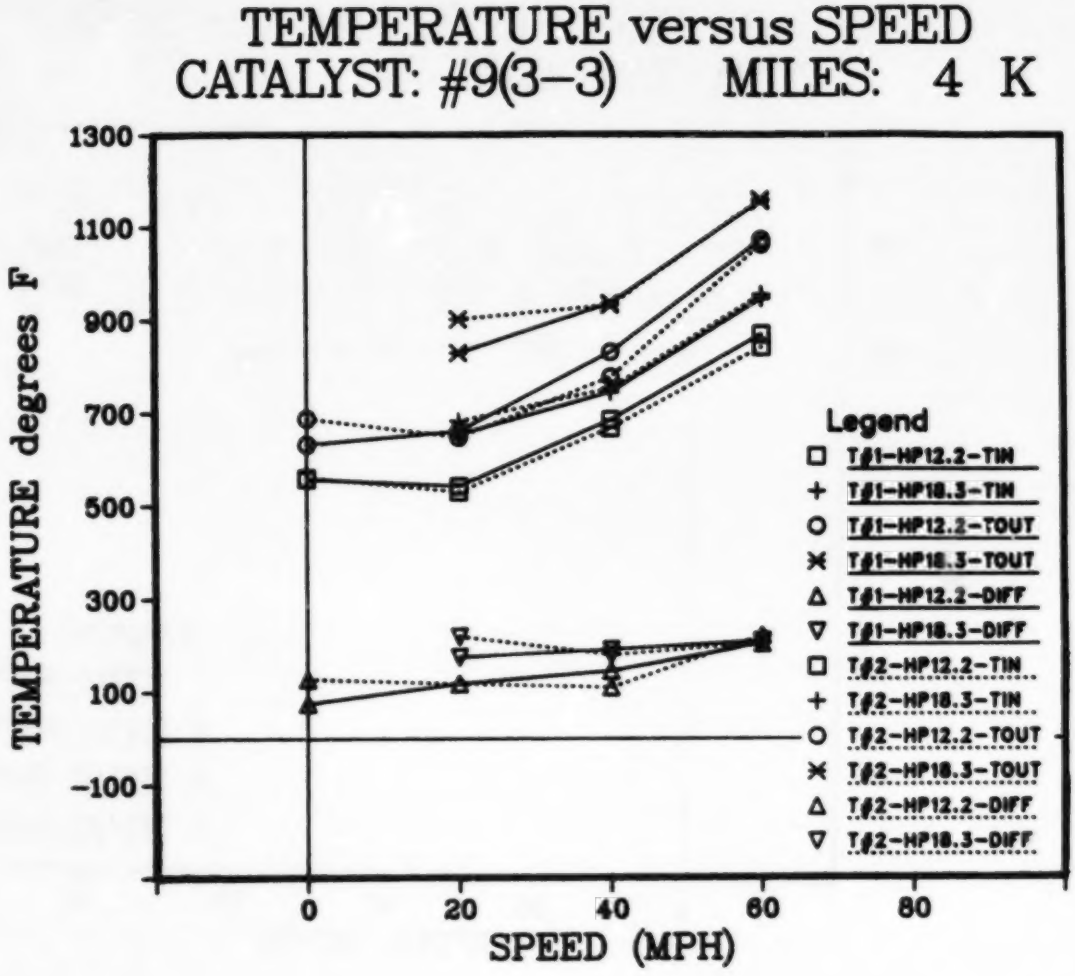

CO EFFICIENCY versus SPEED
CATALYST: #9(3–3) MILES: 0 K
10 % T, SEC 25
50 % T, SEC 53
O'ALL EFF % 93
T50* T, SEC 30
HOT EFF % 100
FTP EFF % 95
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3

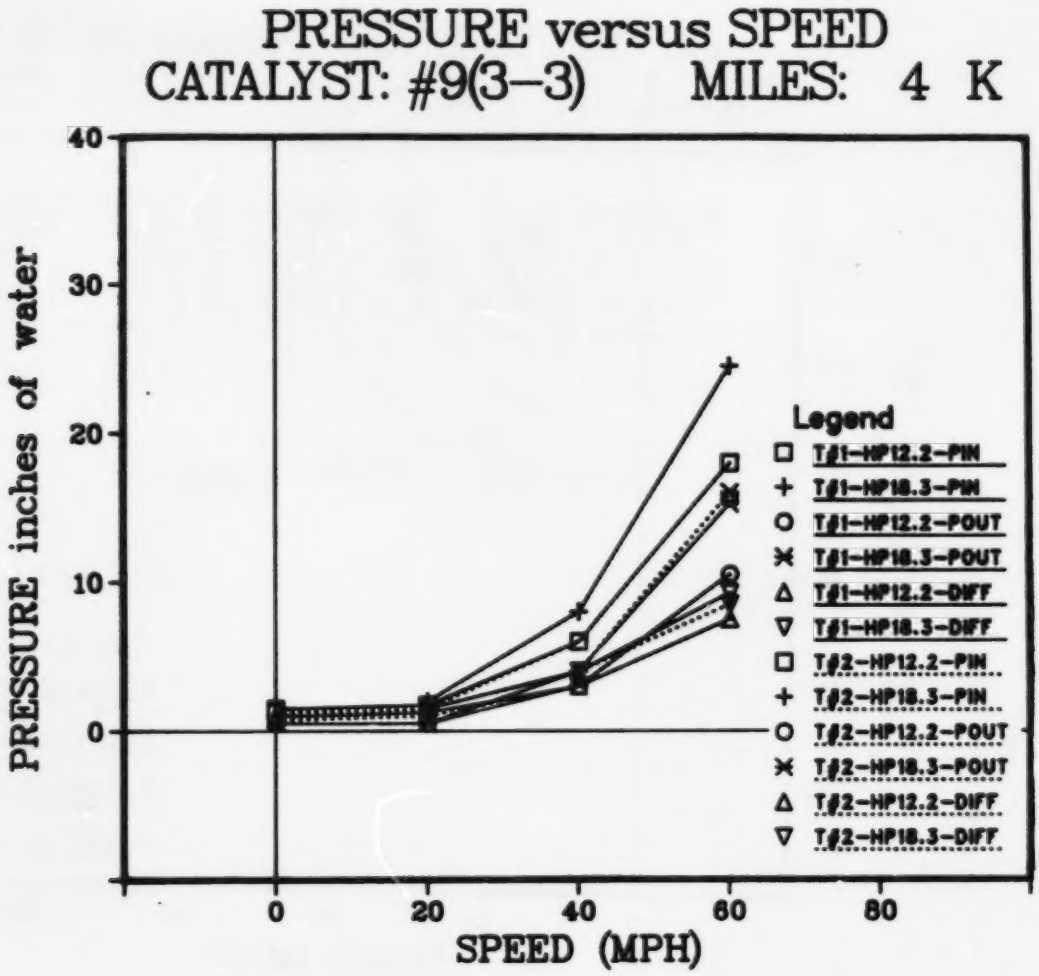

TEMPERATURE versus SPEED
CATALYST: #9(3–3) MILES: 0 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-TIN
T#1-HP18.3-TIN
T#1-HP12.2-TOUT
T#1-HP18.3-TOUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-TIN
T#2-HP18.3-TIN
T#2-HP12.2-TOUT
T#2-HP18.3-TOUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF


PRESSURE versus SPEED
CATALYST: #9(3–3) MILES: 0 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T@1-HP12.2-PIN
T@1-HP18.3-PIN
T@1-HP12.2-POUT
T@1-HP18.3-POUT
T@1-HP12.2-DIFF
T@1-HP18.3-DIFF
T@2-HP12.2-PIN
T@2-HP18.3-PIN
T@2-HP12.2-POUT
T@2-HP18.3-POUT
T@2-HP12.2-DIFF
T@2-HP18.3-DIFF

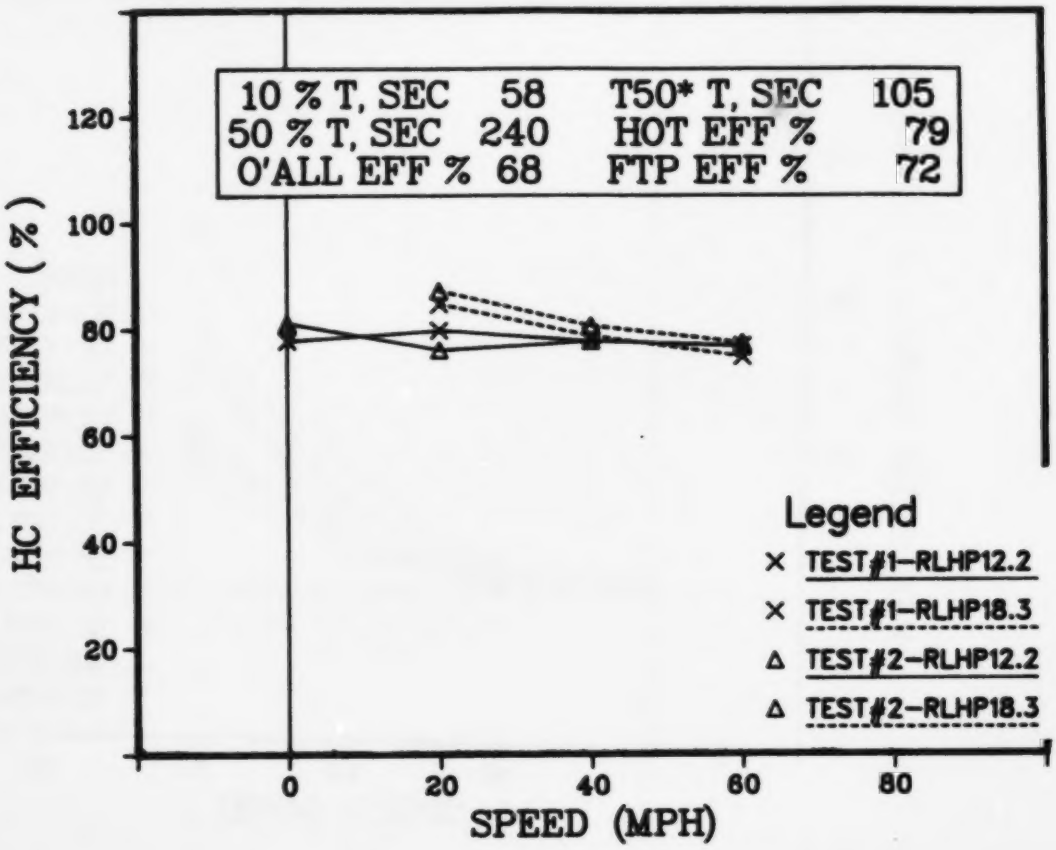

HC EFFICIENCY versus SPEED
CATALYST: #9(3–3) MILES: 4 K
10 % T, SEC 71
50 % T, SEC 227
O'ALL EFF % 73
T50* T, SEC 85
HOT EFF % 85
FTP EFF % 76
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1–RLHP12.2
× TEST#1–RLHP18.3
Δ TEST#2–RLHP12.2
Δ TEST#2–RLHP18.3

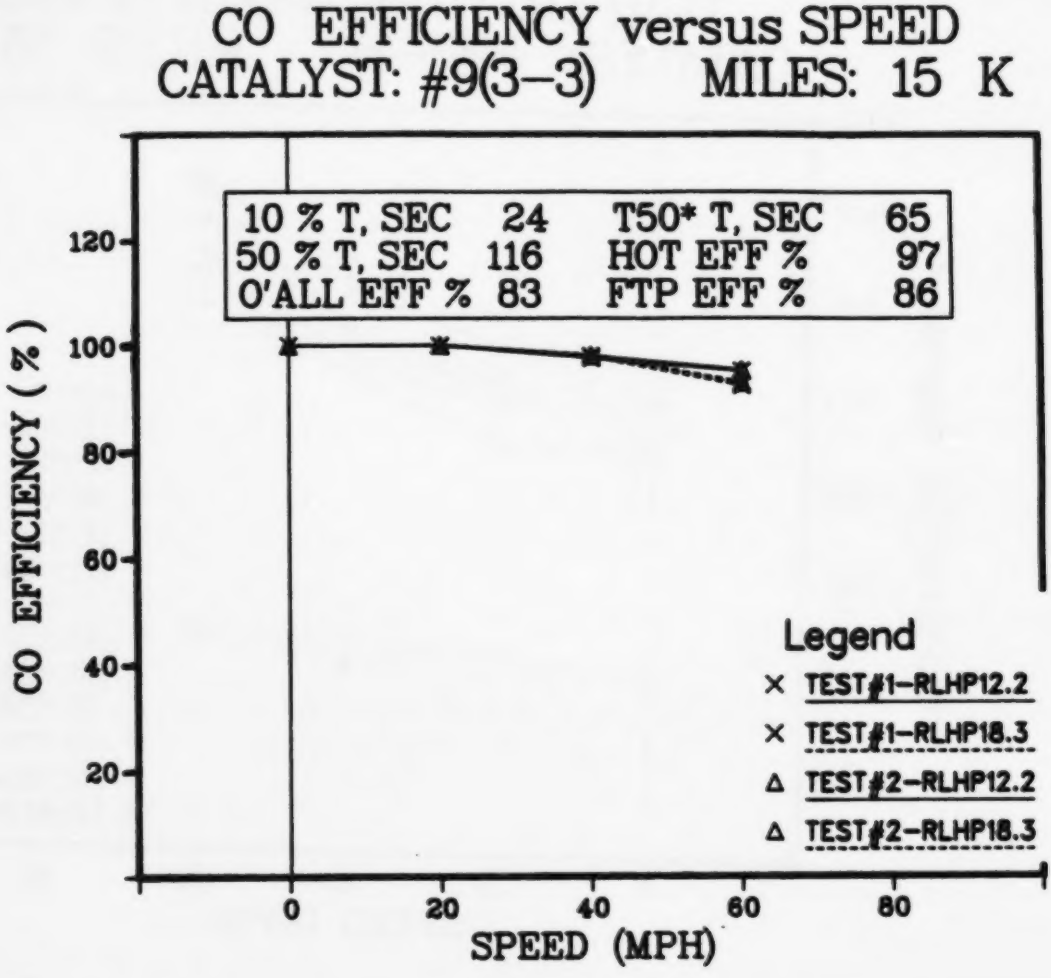

CO EFFICIENCY versus SPEED
CATALYST: #9(3-3) MILES: 4 K
10 % T, SEC 27
50 % T, SEC 103
O'ALL EFF % 88
T50* T, SEC 32
HOT EFF % 99
FTP EFF % 90
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1-RLHP12.2
TEST#1-RLHP18.3
TEST#2-RLHP12.2
TEST#2-RLHP18.3

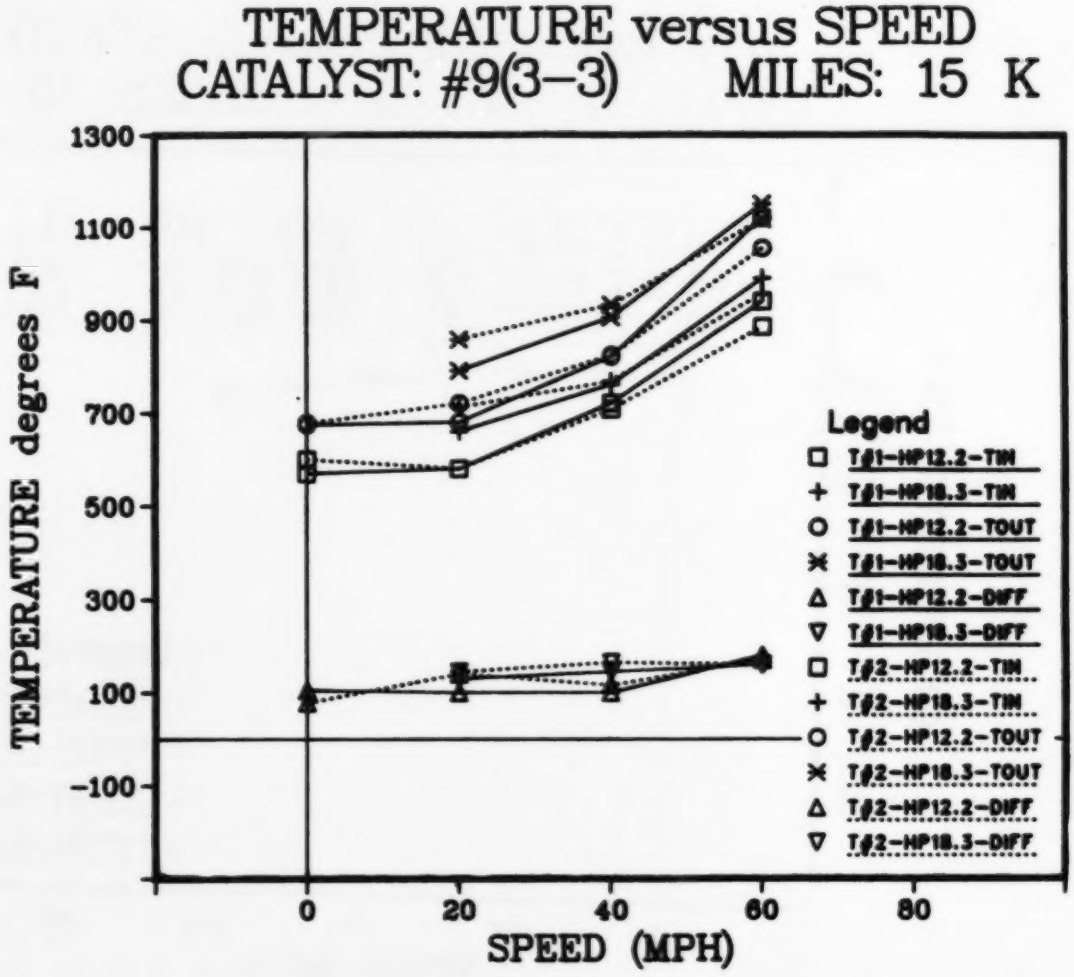

TEMPERATURE versus SPEED
CATALYST: #9(3–3) MILES: 4 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T∅1-HP12.2-TIN
T∅1-HP18.3-TIN
T∅1-HP12.2-TOUT
T∅1-HP18.3-TOUT
T∅1-HP12.2-DIFF
T∅1-HP18.3-DIFF
T∅2-HP12.2-TIN
T∅2-HP18.3-TIN
T∅2-HP12.2-TOUT
T∅2-HP18.3-TOUT
T∅2-HP12.2-DIFF
T∅2-HP18.3-DIFF

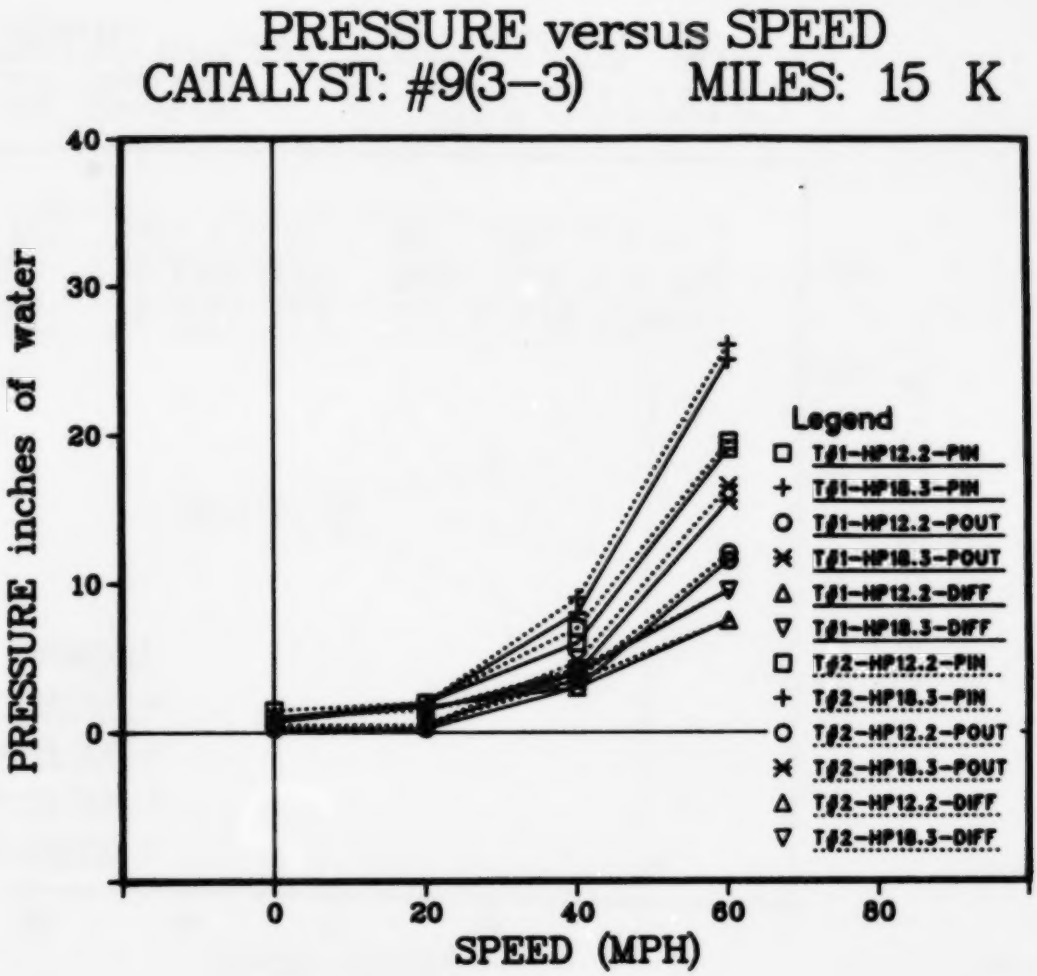

PRESSURE versus SPEED
CATALYST: #9(3–3) MILES: 4 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1–HP12.2–PIN
T#1–HP18.3–PIN
T#1–HP12.2–POUT
T#1–HP18.3–POUT
T#1–HP12.2–DIFF
T#1–HP18.3–DIFF
T#2–HP12.2–PIN
T#2–HP18.3–PIN
T#2–HP12.2–POUT
T#2–HP18.3–POUT
T#2–HP12.2–DIFF
T#2–HP18.3–DIFF

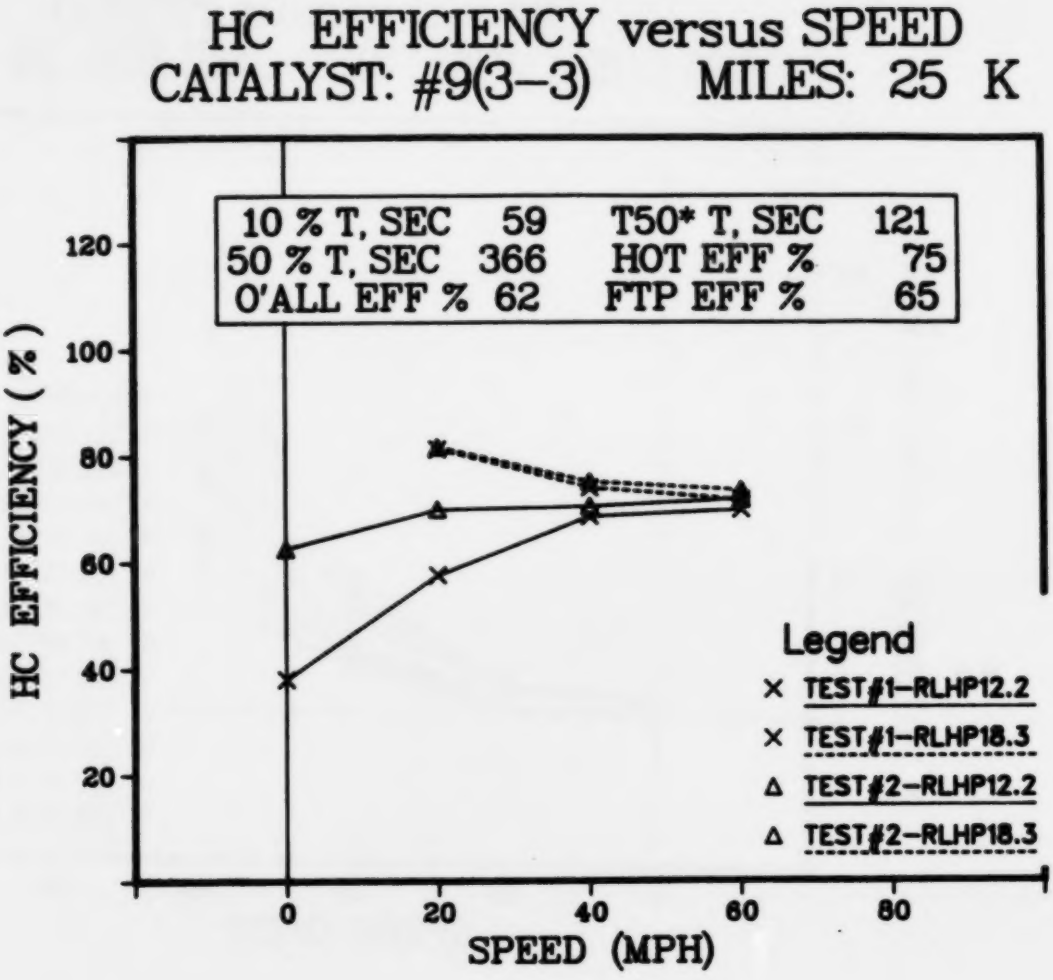
HC EFFICIENCY versus SPEED
CATALYST: #9(3–3) MILES: 15 K

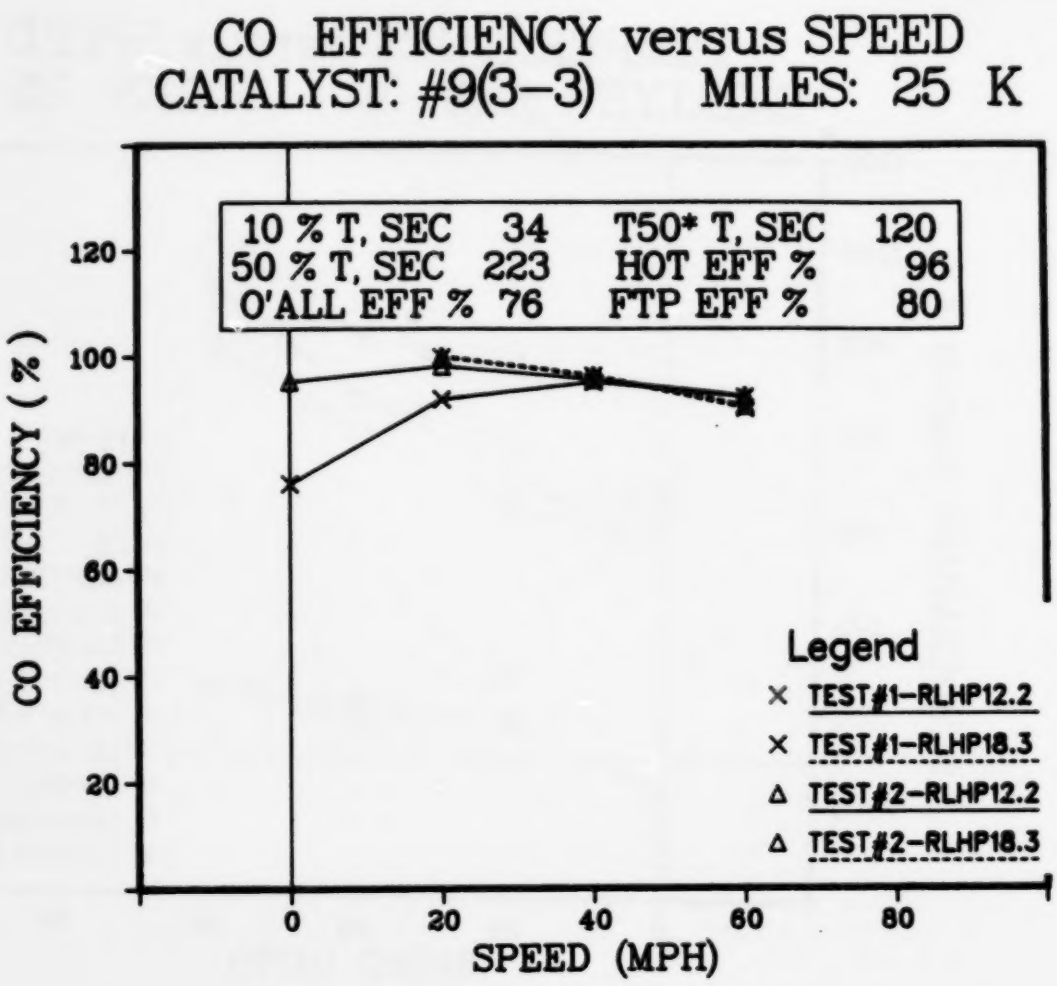


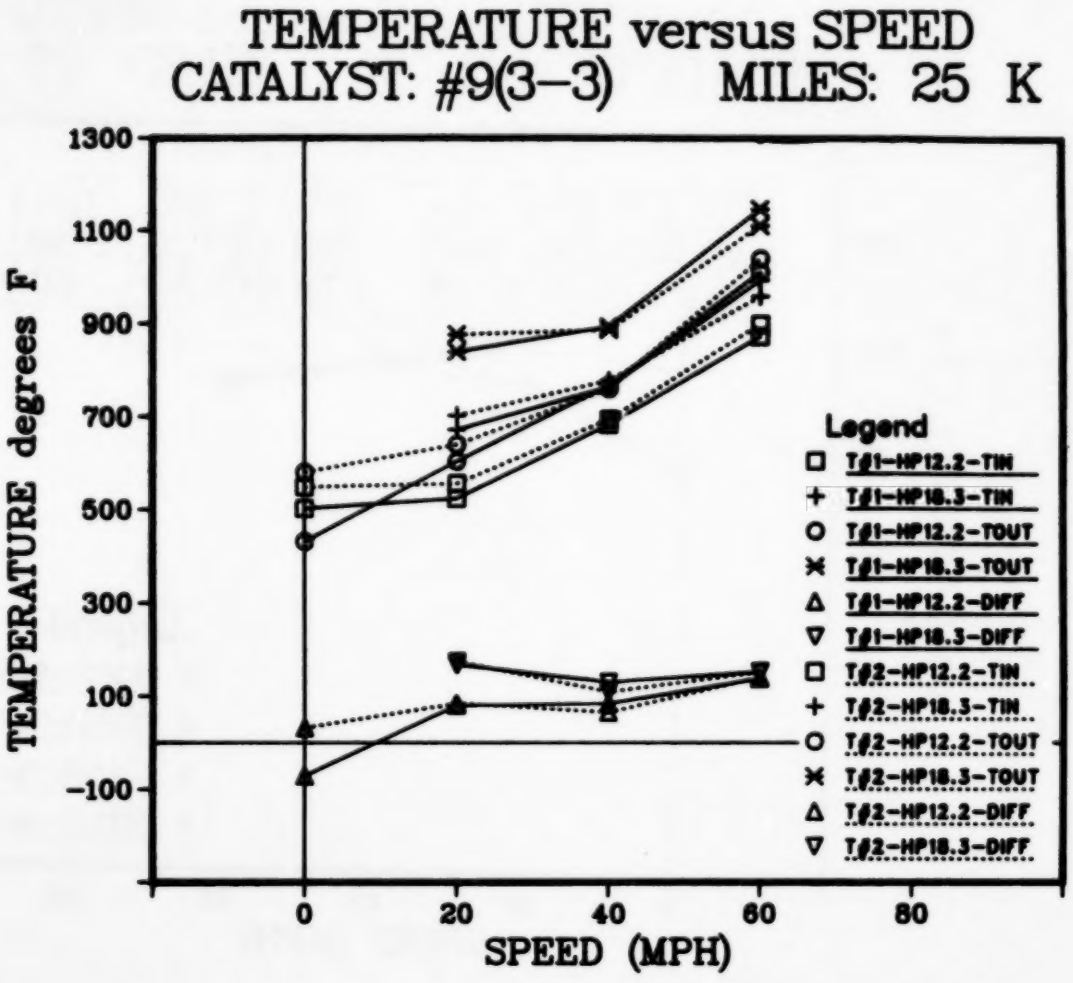

CO EFFICIENCY versus SPEED
CATALYST: #9(3–3) MILES: 15 K
10 % T, SEC 24
50 % T, SEC 116
O'ALL EFF % 83
T50* T, SEC 65
HOT EFF % 97
FTP EFF % 86
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
× TEST#1–RLHP12.2
× TEST#1–RLHP18.3
Δ TEST#2–RLHP12.2
Δ TEST#2–RLHP18.3

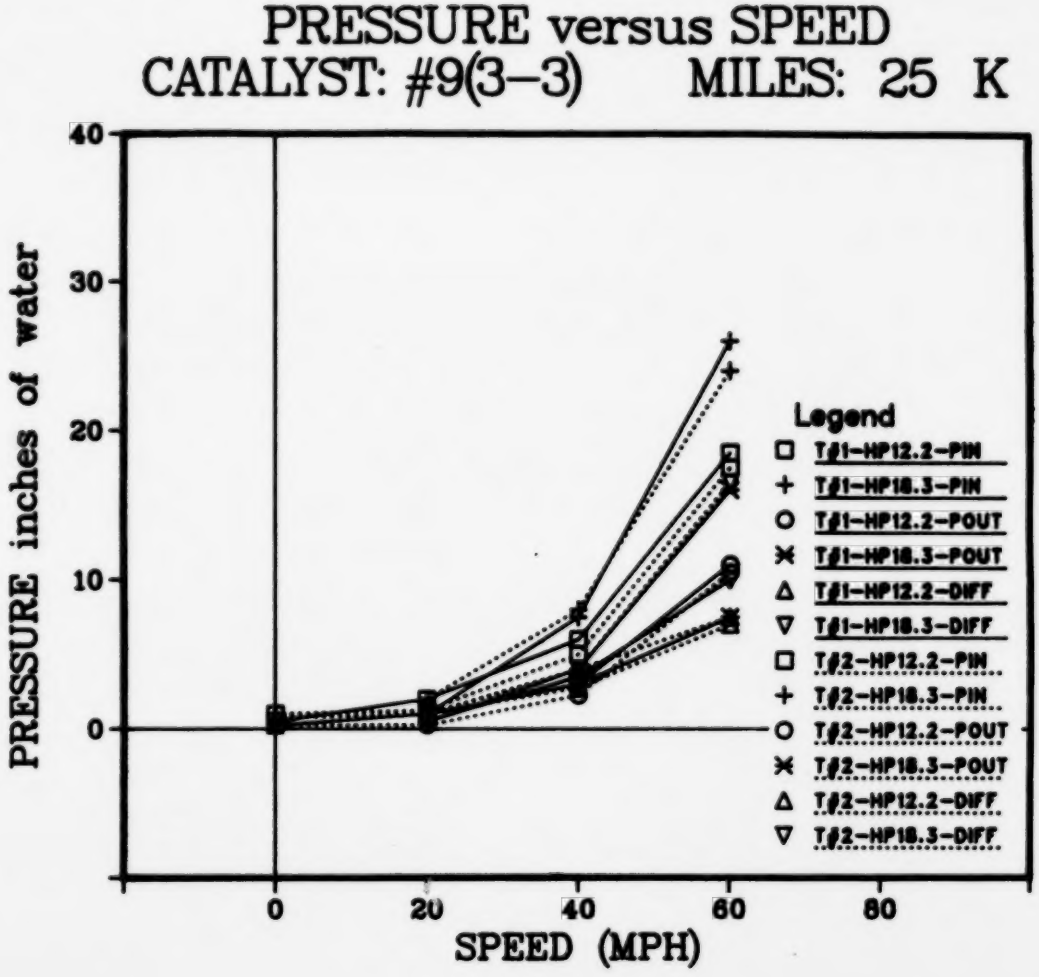

TEMPERATURE versus SPEED
CATALYST: #9(3–3) MILES: 15 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T@1-HP12.2-TIN
T@1-HP18.3-TIN
T@1-HP12.2-TOUT
T@1-HP18.3-TOUT
T@1-HP12.2-DIFF
T@1-HP18.3-DIFF
T@2-HP12.2-TIN
T@2-HP18.3-TIN
T@2-HP12.2-TOUT
T@2-HP18.3-TOUT
T@2-HP12.2-DIFF
T@2-HP18.3-DIFF


PRESSURE versus SPEED
CATALYST: #9(3–3) MILES: 15 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF


HC EFFICIENCY versus SPEED
CATALYST: #9(3–3) MILES: 25 K
10 % T, SEC 59
50 % T, SEC 366
O'ALL EFF % 62
T50* T, SEC 121
HOT EFF % 75
FTP EFF % 65
HC EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3


CO EFFICIENCY versus SPEED
CATALYST: #9(3–3) MILES: 25 K
10 % T, SEC 34
50 % T, SEC 223
O'ALL EFF % 76
T50* T, SEC 120
HOT EFF % 96
FTP EFF % 80
CO EFFICIENCY (%)
120
100
80
60
40
20
0
20
40
60
80
SPEED (MPH)
Legend
TEST#1–RLHP12.2
TEST#1–RLHP18.3
TEST#2–RLHP12.2
TEST#2–RLHP18.3


TEMPERATURE versus SPEED
CATALYST: #9(3–3) MILES: 25 K
TEMPERATURE degrees F
1300
1100
900
700
500
300
100
-100
0
20
40
60
80
SPEED (MPH)
Legend
T∅1-HP12.2-TIN
T∅1-HP18.3-TIN
T∅1-HP12.2-TOUT
T∅1-HP18.3-TOUT
T∅1-HP12.2-DIFF
T∅1-HP18.3-DIFF
T∅2-HP12.2-TIN
T∅2-HP18.3-TIN
T∅2-HP12.2-TOUT
T∅2-HP18.3-TOUT
T∅2-HP12.2-DIFF
T∅2-HP18.3-DIFF


PRESSURE versus SPEED
CATALYST: #9(3–3) MILES: 25 K
PRESSURE inches of water
40
30
20
10
0
0
20
40
60
80
SPEED (MPH)
Legend
T#1-HP12.2-PIN
T#1-HP18.3-PIN
T#1-HP12.2-POUT
T#1-HP18.3-POUT
T#1-HP12.2-DIFF
T#1-HP18.3-DIFF
T#2-HP12.2-PIN
T#2-HP18.3-PIN
T#2-HP12.2-POUT
T#2-HP18.3-POUT
T#2-HP12.2-DIFF
T#2-HP18.3-DIFF

TABULAR LISTING OF DATA FOR CATALYST #1(1-1)

MILES X1000	TEST --	SPEED -----	RLHP -----	HC EFF ------	CO EFF ------	T IN ----	T OUT -----	DEL T -----	P IN -----	P OUT -----	DEL P -----
0	1	0	12.20	87.9	99.2	500	560	60	0.50	0.00	0.50
0	1	20	12.20	81.9	100.0	500	600	100	0.80	0.00	0.80
0	1	40	12.20	87.7	99.8	660	800	140	3.50	1.00	2.50
0	1	60	12.20	87.1	99.5	960	1180	220	10.50	8.00	2.50
0	1	20	18.30	90.7	99.9	540	680	140	0.00	0.00	0.00
0	1	40	18.30	90.1	99.9	710	860	150	2.50	1.00	1.50
0	1	60	18.30	86.7	99.4	1020	1280	260	14.30	13.00	1.30
0	2	0	12.20	17.8	53.6	480	485	5	0.75	0.00	0.75
0	2	20	12.20	68.2	97.9	512	604	92	1.30	0.30	1.00
0	2	40	12.20	85.0	99.9	680	840	160	5.20	2.10	3.10
0	2	60	12.20	86.3	99.5	966	1191	225	19.50	9.50	10.00
0	2	20	18.30	89.7	100.0	581	712	131	1.80	0.20	1.60
0	2	40	18.30	89.1	100.0	722	890	168	6.50	2.50	4.00
0	2	60	18.30	84.8	100.0	1270	1050	-220	26.50	12.80	13.70
25	1	0	12.20	69.5	98.0	580	709	129	1.75	0.50	1.25
25	1	20	12.20	70.6	99.5	546	690	144	1.75	0.50	1.25
25	1	40	12.20	72.9	96.5	681	838	157	6.25	3.00	3.25
25	1	60	12.20	73.4	91.4	880	1091	211	20.00	11.00	9.00
25	1	20	18.30	84.9	99.9	830	641	-189	2.25	0.50	1.75
25	1	40	18.30	77.7	97.0	742	953	211	8.50	4.00	4.50
25	1	60	18.30	74.4	87.6	963	1190	227	25.00	15.50	9.50
25	2	0	12.20	16.9	65.2	497	507	10	1.00	0.50	0.50
25	2	20	12.20	57.9	96.2	527	623	96	1.50	0.50	1.00
25	2	40	12.20	70.1	95.1	724	779	55	6.50	3.00	3.50
25	2	60	12.20	72.6	91.4	955	1125	170	20.50	6.25	14.25
25	2	20	18.30	82.2	99.9	680	849	169	2.00	0.50	1.50
25	2	40	18.30	80.4	97.4	786	909	123	8.00	4.00	4.00
25	2	60	18.30	74.6	88.7	1049	1195	146	28.00	17.50	10.50
25	3	0	12.20	68.9	99.4	545	625	80	1.25	0.25	1.00
25	3	20	12.20	73.2	99.4	545	660	115	2.00	0.50	1.50
25	3	40	12.20	72.9	96.1	675	800	125	7.00	2.50	4.50
25	3	60	12.20	71.3	89.7	875	1055	180	18.00	10.75	7.25
25	3	20	18.30	91.5	99.9	630	810	180	2.00	0.50	1.50
25	3	40	18.30	76.2	96.7	740	900	160	8.50	3.50	5.00
25	3	60	18.30	71.2	86.8	950	1120	170	24.50	4.75	19.75

TABULAR LISTING OF DATA FOR CATALYST #2(1-2)

MILES X1000	TEST --	SPEED	RLHP	HC EFF	CO EFF	T IN	T OUT	DEL T	P IN	P OUT	DEL P
0	1	0	12.20	19.8	65.4	479	482	3	1.50	0.25	1.25
0	1	20	12.20	72.0	99.0	517	604	87	2.00	0.25	1.75
0	1	40	12.20	86.4	100.0	680	790	110	6.00	3.00	3.00
0	1	60	12.20	85.2	99.6	835	1025	190	21.75	11.50	10.25
0	1	20	18.30	89.9	100.0	582	720	138	1.50	0.25	1.25
0	1	40	18.30	89.4	100.0	730	889	159	7.25	3.50	3.75
0	1	60	18.30	85.3	99.2	1032	1253	221	28.25	16.00	12.25
0	2	0	12.20	65.1	99.8	525	615	90	1.75	0.25	1.50
0	2	20	12.20	83.7	100.0	519	629	110	2.00	0.50	1.50
0	2	40	12.20	88.5	99.8	685	791	106	6.00	2.75	3.25
0	2	60	12.20	87.3	99.5	944	1138	194	21.00	11.00	10.00
0	2	20	18.30	91.4	100.0	589	740	151	2.25	0.25	2.00
0	2	40	18.30	89.8	99.9	715	874	159	7.00	3.25	3.75
0	2	60	18.30	86.7	99.3	1014	1249	235	28.25	16.00	12.25
4	1	0	12.20	79.6	99.9	530	650	120	1.50	0.50	1.00
4	1	20	12.20	91.0	100.0	535	660	125	3.75	0.75	3.00
4	1	40	12.20	88.5	99.8	705	850	145	6.50	3.00	3.50
4	1	60	12.20	85.1	99.2	890	1105	215	19.50	10.25	9.25
4	1	20	18.30	94.2	100.0	610	790	180	2.00	1.00	1.00
4	1	40	18.30	89.8	99.9	740	945	205	8.50	3.75	4.75
4	1	60	18.30	84.0	99.0	950	1180	230	26.00	14.25	11.75
4	2	0	12.20	73.5	99.8	530	751	221	1.75	0.50	1.25
4	2	20	12.20	72.7	100.0	570	636	66	1.75	0.50	1.25
4	2	40	12.20	85.0	99.7	670	788	118	6.00	3.00	3.00
4	2	60	12.20	82.8	98.9	870	1065	195	18.00	10.50	7.50
4	2	20	18.30	90.1	100.0	627	780	153	2.00	0.50	1.50
4	2	40	18.30	88.3	99.8	739	912	173	8.00	4.00	4.00
4	2	60	18.30	82.2	98.7	945	1147	202	25.00	14.50	10.50
15	1	0	12.20	72.3	99.7	565	690	125	1.50	0.50	1.00
15	1	20	12.20	78.3	99.9	545	717	172	2.00	0.50	1.50
15	1	40	12.20	77.4	98.7	680	820	140	7.00	3.00	4.00
15	1	60	12.20	79.4	97.0	879	1067	188	20.00	12.00	8.00
15	1	20	18.30	90.5	99.9	666	883	217	2.00	0.50	1.50
15	1	40	18.30	84.5	99.4	728	950	222	9.50	4.50	5.00
15	1	60	18.30	79.5	96.6	949	1147	198	26.50	16.00	10.50
15	2	0	12.20	70.4	100.0	541	635	94	2.00	0.50	1.50
15	2	20	12.20	77.4	100.0	547	700	153	2.00	0.50	1.50
15	2	40	12.20	77.0	98.6	682	878	196	7.00	3.00	4.00
15	2	60	12.20	78.2	96.6	870	1076	206	20.00	11.00	9.00
15	2	20	18.30	91.1	99.9	670	915	245	2.50	0.50	2.00
15	2	40	18.30	83.9	99.3	757	958	201	10.00	4.00	6.00
15	2	60	18.30	79.6	96.4	954	1158	204	27.00	16.50	10.50
25	1	0	12.20	66.3	98.7	610	815	205	2.00	0.50	1.50
25	1	20	12.20	68.6	97.7	580	686	106	2.50	0.50	2.00
25	1	40	12.20	67.8	90.5	689	785	96	7.50	3.50	4.00
25	1	60	12.20	68.6	89.7	864	1009	145	21.00	11.50	9.50
25	1	20	18.30	79.7	99.8	680	904	224	3.00	0.50	2.50
25	1	40	18.30	72.6	94.8	747	890	143	9.00	4.50	4.50
25	1	60	18.30	71.4	92.1	940	1106	166	27.00	16.00	11.00
25	2	0	12.20	60.9	97.4	556	812	256	2.00	0.50	1.50
25	2	20	12.20	63.1	98.1	535	630	95	2.75	0.50	2.25
25	2	40	12.20	70.0	94.0	668	770	102	6.50	3.50	3.00
25	2	60	12.20	71.3	93.4	853	1010	157	20.00	10.50	9.50
25	2	20	18.30	84.7	100.0	664	850	186	3.00	0.75	2.25
25	2	40	18.30	76.9	97.8	760	895	135	8.00	4.00	4.00
25	2	60	18.30	72.9	93.3	953	1107	154	25.00	15.00	10.00

TABULAR LISTING OF DATA FOR CATALYST #3(1-3)

MILES X1000	TEST --	SPEED	RLHP	HC EFF	CO EFF	T IN	T OUT	DEL T	P IN	P OUT	DEL P
0	1	0	12.20	69.8	99.7	532	651	119	1.50	0.25	1.25
0	1	20	12.20	79.7	99.9	524	640	116	1.50	0.25	1.25
0	1	40	12.20	84.7	99.8	689	787	98	5.25	2.75	2.50
0	1	60	12.20	88.9	99.6	943	1148	205	20.00	11.50	8.50
0	1	20	18.30	89.3	99.9	606	771	165	2.00	0.50	1.50
0	1	40	18.30	89.4	99.9	720	915	195	7.25	3.50	3.75
0	1	60	18.30	87.4	99.5	1014	1267	253	27.50	16.00	11.50
0	2	0	12.20	67.4	99.3	522	583	61	1.25	0.25	1.00
0	2	20	12.20	77.4	100.0	514	591	77	1.50	0.50	1.00
0	2	40	12.20	85.9	99.9	670	770	100	5.00	2.50	2.50
0	2	60	12.20	87.4	99.6	938	1125	187	19.50	11.25	8.25
0	2	20	18.30	90.8	100.0	610	728	118	2.00	0.50	1.50
0	2	40	18.30	88.7	99.9	718	828	110	7.00	3.00	4.00
0	2	60	18.30	87.0	99.4	1003	1204	201	26.00	15.00	11.00
4	1	0	12.20	72.4	99.2	526	615	89	1.75	0.25	1.50
4	1	20	12.20	73.7	99.8	530	643	113	2.00	0.25	1.75
4	1	40	12.20	89.7	97.9	683	820	137	6.50	2.75	3.75
4	1	60	12.20	76.4	96.5	867	1080	213	17.75	10.50	7.25
4	1	20	18.30	85.5	99.9	633	790	157	2.00	0.25	1.75
4	1	40	18.30	79.0	98.4	746	926	180	8.50	4.00	4.50
4	1	60	18.30	78.0	95.5	925	1140	215	24.50	15.00	9.50
4	2	0	12.20	64.4	99.7	520	620	100	1.25	0.25	1.00
4	2	20	12.20	76.3	99.9	527	640	113	1.50	0.25	1.25
4	2	40	12.20	77.3	98.3	680	810	130	5.75	2.75	3.00
4	2	60	12.20	78.0	96.4	880	1088	208	18.25	10.75	7.50
4	2	20	18.30	86.6	100.0	615	770	155	1.75	0.25	1.50
4	2	40	18.30	80.2	98.5	740	920	180	8.50	3.75	4.75
4	2	60	18.30	78.0	95.2	960	1175	215	23.50	14.25	9.25
15	1	0	12.20	34.7	39.9	561	570	9	0.75	0.50	0.25
15	1	20	12.20	39.9	47.8	564	599	35	1.25	0.50	0.75
15	1	40	12.20	38.8	48.5	686	715	29	4.75	2.75	2.00
15	1	60	12.20	42.6	42.6	890	954	64	15.00	11.00	4.00
15	1	20	18.30	55.7	60.1	656	741	85	1.50	0.50	1.00
15	1	40	18.30	43.0	45.4	761	820	59	6.00	4.00	2.00
15	1	60	18.30	41.9	39.4	965	1022	57	19.50	15.50	4.00
15	2	0	12.20	27.9	37.8	550	535	-15	0.75	0.25	0.50
15	2	20	12.20	31.9	45.1	550	590	40	1.00	0.50	0.50
15	2	40	12.20	37.5	49.2	690	730	40	4.25	2.25	2.00
15	2	60	12.20	41.0	42.2	880	950	70	14.25	10.50	3.75
15	2	20	18.30	51.2	62.4	660	750	90	1.00	0.50	0.50
15	2	40	18.30	42.2	48.1	758	830	72	5.50	4.00	1.50
15	2	60	18.30	42.9	38.2	960	1010	50	18.50	14.50	4.00
25	1	0	12.20	4.0	12.5	469	387	-82	0.25	0.25	0.00
25	1	20	12.20	13.8	12.1	511	446	-65	0.25	0.25	0.00
25	1	40	12.20	26.2	28.1	648	614	-34	4.00	2.50	1.50
25	1	60	12.20	31.1	33.0	838	838	0	12.00	10.00	2.00
25	1	20	18.30	33.7	49.0	631	681	50	1.00	0.25	0.75
25	1	40	18.30	33.2	31.9	731	742	11	4.00	3.00	1.00
25	1	60	18.30	32.8	29.4	923	935	12	19.00	13.00	6.00
25	2	0	12.20	14.8	24.5	518	461	-57	0.50	0.25	0.25
25	2	20	12.20	18.3	22.9	533	507	-26	1.00	0.25	0.75
25	2	40	12.20	29.6	29.8	672	648	-24	5.00	3.00	2.00
25	2	60	12.20	28.4	29.9	844	837	-7	13.00	9.00	4.00
25	2	20	18.30	34.3	43.5	662	721	59	0.75	0.25	0.50
25	2	40	18.30	30.3	33.0	764	790	26	7.00	4.00	3.00
25	2	60	18.30	31.3	30.9	933	939	6	19.50	13.00	6.50

TABULAR LISTING OF DATA FOR CATALYST #4(2-1)

MILES X1000	TEST --	SPEED -----	RLHP -----	HC EFF ------	CO EFF ------	T IN ----	T OUT -----	DEL T -----	P IN -----	P OUT -----	DEL P -----
0	1	0	12.20	77.1	99.9	542	660	118	2.00	0.25	1.75
0	1	20	12.20	83.0	99.7	535	643	108	1.75	0.25	1.50
0	1	40	12.20	83.5	98.3	698	782	84	7.75	2.75	5.00
0	1	60	12.20	84.9	97.1	915	1064	149	24.50	10.50	14.00
0	1	20	18.30	90.3	100.0	640	843	203	2.00	0.25	1.75
0	1	40	18.30	86.2	98.6	755	900	145	9.50	4.00	5.50
0	1	60	18.30	84.4	96.3	978	1146	168	34.00	14.75	19.25
0	2	0	12.20	76.1	99.9	540	671	131	1.50	0.25	1.25
0	2	20	12.20	80.0	99.4	524	611	87	1.50	0.25	1.25
0	2	40	12.20	81.5	97.3	684	734	50	7.75	2.75	5.00
0	2	60	12.20	82.3	96.0	885	998	113	25.00	10.25	14.75
0	2	20	18.30	91.0	100.0	636	832	196	2.00	0.25	1.75
0	2	40	18.30	84.9	97.9	752	869	117	10.00	3.50	6.50
0	2	60	18.30	82.3	95.2	958	1097	139	33.00	14.00	19.00
25	1	0	12.20	13.8	52.4	477	457	-20	0.75	0.25	0.50
25	1	20	12.20	46.6	71.2	519	510	-9	2.50	0.25	2.25
25	1	40	12.20	52.0	69.0	682	661	-21	6.50	3.00	3.50
25	1	60	12.20	51.3	60.0	940	963	23	26.25	10.50	15.75
25	1	20	18.30	72.7	89.6	680	837	157	2.00	0.25	1.75
25	1	40	18.30	58.7	70.6	779	847	68	10.75	4.00	6.75
25	1	60	18.30	54.4	58.5	988	1022	34	34.00	14.00	20.00
25	2	0	12.20	13.2	43.4	472	445	-27	0.75	0.25	0.50
25	2	20	12.20	49.6	72.4	522	500	-22	1.25	0.25	1.00
25	2	40	12.20	52.2	68.0	694	673	-21	8.25	2.25	6.00
25	2	60	12.20	53.9	60.8	909	931	22	24.00	8.50	15.50
25	2	20	18.30	66.4	86.2	661	805	144	1.25	0.50	0.75
25	2	40	18.30	57.2	69.2	775	836	61	10.00	3.75	6.25
25	2	60	18.30	54.4	57.6	990	1020	30	32.00	12.50	19.50

TABULAR LISTING OF DATA FOR CATALYST #5(2-2)

MILES X1000	TEST --	SPEED ----	RLHP -----	HC EFF ------	CO EFF ------	T IN ----	T OUT -----	DEL T -----	P IN -----	P OUT -----	DEL P -----
0	1	0	12.20	71.7	98.3	523	651	128	1.50	0.25	1.25
0	1	20	12.20	82.3	99.3	530	630	100	1.50	0.25	1.25
0	1	40	12.20	82.4	97.6	688	763	75	7.75	2.75	5.00
0	1	60	12.20	83.1	96.6	899	1033	134	25.25	10.50	14.75
0	1	20	18.30	89.6	99.6	660	886	226	2.00	0.25	1.75
0	1	40	18.30	84.3	98.3	763	902	139	10.00	3.75	6.25
0	1	60	18.30	82.8	95.9	968	1114	146	33.75	15.00	18.75
0	2	0	12.20	74.5	98.5	558	681	123	1.75	0.25	1.50
0	2	20	12.20	80.6	98.9	542	626	84	2.00	0.50	1.50
0	2	40	12.20	81.3	96.7	704	760	56	8.00	3.25	4.75
0	2	60	12.20	82.5	94.4	892	1019	127	24.00	10.00	14.00
0	2	20	18.30	87.9	99.5	652	851	199	2.00	0.25	1.75
0	2	40	18.30	83.7	97.7	769	897	128	9.50	4.00	5.50
0	2	60	18.30	82.9	94.2	979	1118	139	34.00	14.00	20.00
4	1	0	12.20	68.5	94.6	575	695	120	2.00	0.50	1.50
4	1	20	12.20	64.5	90.3	560	671	111	2.00	0.50	1.50
4	1	40	12.20	64.7	84.2	713	772	59	9.00	4.00	5.00
4	1	60	12.20	66.3	79.7	938	1064	126	26.50	11.00	15.50
4	1	20	18.30	81.3	97.7	690	900	210	2.75	0.50	2.25
4	1	40	18.30	69.0	84.7	780	880	100	11.00	4.00	7.00
4	1	60	18.30	66.6	76.7	966	1080	114	36.00	15.50	20.50
4	2	0	12.20	64.4	92.5	518	617	99	1.50	0.50	1.00
4	2	20	12.20	69.4	94.0	509	592	83	1.50	0.50	1.00
4	2	40	12.20	64.2	84.2	670	717	47	8.00	2.75	5.25
4	2	60	12.20	63.6	76.7	875	960	85	25.00	10.00	15.00
4	2	20	18.30	81.0	96.3	611	771	160	2.50	0.50	2.00
4	2	40	18.30	68.3	82.9	750	850	100	10.50	4.00	6.50
4	2	60	18.30	64.1	74.5	965	1053	88	34.50	15.00	19.50
15	1	0	12.20	61.5	85.1	567	673	106	1.50	0.50	1.00
15	1	20	12.20	57.3	83.0	567	650	83	2.00	0.75	1.25
15	1	40	12.20	51.5	69.4	711	745	34	9.50	3.00	6.50
15	1	60	12.20	51.8	60.1	909	951	42	28.50	11.00	17.50
15	1	20	18.30	68.7	89.1	670	812	142	2.50	0.50	2.00
15	1	40	18.30	54.1	68.6	782	859	77	12.50	4.50	8.00
15	1	60	18.30	49.3	58.3	1006	1009	3	38.75	15.00	23.75
15	2	0	12.20	64.6	87.9	580	704	124	1.50	0.50	1.00
15	2	20	12.20	64.5	84.2	587	667	80	2.50	0.50	2.00
15	2	40	12.20	55.7	70.2	710	747	37	10.00	3.50	6.50
15	2	60	12.20	54.3	60.8	894	911	17	28.00	11.00	17.00
15	2	20	18.30	75.7	88.2	695	864	169	3.00	0.50	2.50
15	2	40	18.30	58.6	69.6	786	870	84	12.50	4.00	8.50
15	2	60	18.30	58.2	58.0	995	1015	20	38.50	15.00	23.50
25	2	0	12.20	46.6	82.6	534	558	24	0.50	0.12	0.38
25	2	20	12.20	51.9	79.5	560	589	29	1.00	0.50	0.50
25	2	40	12.20	47.7	64.4	705	684	-21	10.00	3.00	7.00
25	2	60	12.20	47.2	56.5	896	898	2	28.00	11.00	17.00
25	2	20	18.30	64.3	86.8	728	856	128	2.00	0.50	1.50
25	2	40	18.30	52.7	68.2	782	851	69	12.00	4.00	8.00
25	2	60	18.30	46.6	51.7	968	978	10	37.00	14.00	23.00

TABULAR LISTING OF DATA FOR CATALYST #6(2-3)

MILES X1000	TEST --	SPEED -----	RLHP -----	HC EFF ------	CO EFF ------	T IN ----	T OUT -----	DEL T -----	P IN -----	P OUT -----	DEL P -----
0	1	0	12.20	68.3	98.8	548	660	112	1.25	0.25	1.00
0	1	20	12.20	78.4	98.2	545	642	97	1.75	0.50	1.25
0	1	40	12.20	78.6	96.0	785	695	-90	8.00	3.00	5.00
0	1	60	12.20	80.0	94.1	905	1040	135	26.25	10.50	15.75
0	1	20	18.30	86.5	99.3	440	795	355	2.00	0.25	1.75
0	1	40	18.30	77.6	96.7	766	885	119	10.50	3.75	6.75
0	1	60	18.30	80.9	92.3	980	1110	130	34.00	14.50	19.50
0	2	0	12.20	67.0	95.4	521	629	108	1.50	0.25	1.25
0	2	20	12.20	73.9	96.3	525	598	73	1.75	0.25	1.50
0	2	40	12.20	77.5	94.6	661	710	49	8.00	2.50	5.50
0	2	60	12.20	80.4	91.7	884	1000	116	26.00	10.50	15.50
0	2	20	18.30	86.4	98.8	640	830	190	2.00	0.25	1.75
0	2	40	18.30	91.6	95.9	740	843	103	10.00	3.50	6.50
0	2	60	18.30	81.0	89.1	979	1095	116	35.00	14.25	20.75
4	1	0	12.20	62.0	87.2	605	751	146	1.50	0.50	1.00
4	1	20	12.20	64.5	88.2	538	625	87	1.50	0.50	1.00
4	1	40	12.20	66.1	85.9	680	730	50	8.00	3.00	5.00
4	1	60	12.20	67.9	82.5	885	975	90	25.00	10.00	15.00
4	1	20	18.30	77.4	92.3	636	820	184	2.00	0.50	1.50
4	1	40	18.30	70.5	86.1	756	861	105	10.50	4.00	6.50
4	1	60	18.30	68.7	80.8	968	1075	107	35.00	14.50	20.50
4	2	0	12.20	65.7	88.8	540	650	110	1.25	0.25	1.00
4	2	20	12.20	68.7	89.3	540	625	85	1.50	0.25	1.25
4	2	40	12.20	66.9	84.9	685	725	40	7.75	2.75	5.00
4	2	60	12.20	67.2	80.8	888	970	82	25.00	10.50	14.50
4	2	20	18.30	77.1	91.4	630	800	170	1.75	0.25	1.50
4	2	40	18.30	68.6	84.7	750	835	85	10.25	4.00	6.25
4	2	60	18.30	68.3	78.9	965	1060	95	34.50	14.25	20.25

TABULAR LISTING OF DATA FOR CATALYST #7(3-1)

MILES X1000	TEST --	SPEED ----	RLHP -----	HC EFF ------	CO EFF ------	T IN ----	T OUT -----	DEL T -----	P IN -----	P OUT -----	DEL P -----
0	1	0	12.20	72.1	98.2	500	565	65	1.50	0.25	1.25
0	1	20	12.20	88.7	100.0	506	572	66	1.50	0.25	1.25
0	1	40	12.20	88.0	99.7	677	777	100	5.50	2.75	2.75
0	1	60	12.20	85.0	99.3	897	1077	180	18.75	11.00	7.75
0	1	20	18.30	93.1	100.0	628	751	123	1.50	0.25	1.25
0	1	40	18.30	89.0	99.7	733	859	126	6.50	3.50	3.00
0	1	60	18.30	82.9	99.0	977	1180	203	24.50	14.50	10.00
0	2	0	12.20	88.5	100.0	568	656	88	1.25	0.25	1.00
0	2	20	12.20	91.7	100.0	550	650	100	2.00	0.25	1.75
0	2	40	12.20	88.0	99.8	691	809	118	5.50	3.00	2.50
0	2	60	12.20	86.4	99.4	892	1098	206	18.00	11.00	7.00
0	2	20	18.30	93.6	100.0	628	770	142	1.50	0.25	1.25
0	2	40	18.30	89.1	99.8	746	909	163	7.50	3.75	3.75
0	2	60	18.30	85.8	99.0	950	1164	214	24.50	15.00	9.50
25	1	0	12.20	27.7	57.3	501	476	-25	0.25	0.12	0.13
25	1	20	12.20	70.5	96.1	525	591	66	1.50	0.75	0.75
25	1	40	12.20	70.6	94.7	673	729	56	6.00	3.12	2.88
25	1	60	12.20	75.1	95.1	867	1007	140	16.00	10.00	6.00
25	1	20	18.30	83.3	96.5	655	825	170	1.25	0.75	0.50
25	1	40	18.30	77.8	96.3	758	892	134	7.00	3.25	3.75
25	1	60	18.30	76.2	94.0	946	1098	152	22.00	14.00	8.00
25	2	0	12.20	4.6	13.1	505	464	-41	0.75	0.25	0.50
25	2	20	12.20	59.4	94.0	516	566	50	1.00	0.75	0.25
25	2	40	12.20	67.3	98.3	668	739	71	5.50	3.25	2.25
25	2	60	12.20	74.1	95.7	861	997	136	18.00	10.25	7.75
25	2	20	18.30	81.5	100.0	645	774	129	2.75	0.50	2.25
25	2	40	18.30	76.4	97.9	745	867	122	6.00	3.00	3.00
25	2	60	18.30	76.6	94.8	951	1101	150	24.00	15.00	9.00

TABULAR LISTING OF DATA FOR CATALYST #8(3-2)

MILES X1000	TEST --	SPEED	RLHP	HC EFF	CO EFF	T IN	T OUT	DEL T	P IN	P OUT	DEL P
0	1	0	12.20	89.5	100.0	510	630	120	1.00	0.25	0.75
0	1	20	12.20	90.9	99.9	521	622	101	1.25	0.35	0.90
0	1	40	12.20	88.2	99.7	675	820	145	5.50	3.00	2.50
0	1	60	12.20	85.6	99.2	890	1110	220	18.00	10.50	7.50
0	1	20	18.30	92.8	99.9	625	780	155	1.75	0.25	1.50
0	1	40	18.30	88.9	99.8	730	880	150	7.25	3.25	4.00
0	1	60	18.30	85.5	98.9	950	1180	230	24.25	14.50	9.75
0	2	0	12.20	89.0	99.8	557	666	109	1.75	0.25	1.50
0	2	20	12.20	90.3	99.9	541	647	106	1.50	0.25	1.25
0	2	40	12.20	88.2	99.8	694	824	130	5.50	2.75	2.75
0	2	60	12.20	85.9	99.3	885	1115	230	18.50	10.50	8.00
0	2	20	18.30	92.2	99.9	644	828	184	2.00	0.25	1.75
0	2	40	18.30	88.3	99.8	750	944	194	7.75	4.00	3.75
0	2	60	18.30	86.0	99.0	960	1195	235	25.00	15.00	10.00
4	1	0	12.20	84.3	99.7	544	626	82	1.50	0.50	1.00
4	1	20	12.20	88.4	99.9	536	644	108	1.75	0.50	1.25
4	1	40	12.20	84.5	99.5	674	826	152	7.00	3.00	4.00
4	1	60	12.20	82.5	98.5	881	1106	225	19.00	11.50	7.50
4	1	20	18.30	91.1	99.9	632	806	174	2.00	0.50	1.50
4	1	40	18.30	86.9	99.5	745	956	211	8.50	4.00	4.50
4	1	60	18.30	82.1	97.9	952	1169	217	25.50	16.00	9.50
4	2	0	12.20	85.3	100.0	533	616	83	1.50	0.50	1.00
4	2	20	12.20	88.5	99.9	517	621	104	1.75	0.50	1.25
4	2	40	12.20	84.7	99.2	670	775	105	6.00	3.00	3.00
4	2	60	12.20	81.9	98.3	879	1068	189	19.50	11.50	8.00
4	2	20	18.30	91.6	100.0	660	820	160	2.00	0.50	1.50
4	2	40	18.30	85.9	99.5	730	856	126	7.00	3.50	3.50
4	2	60	18.30	81.7	98.1	930	1115	185	22.00	13.50	8.50
15	1	0	12.20	71.2	97.3	574	675	101	1.50	0.50	1.00
15	1	20	12.20	72.0	98.6	543	603	60	2.00	0.50	1.50
15	1	40	12.20	72.5	96.7	673	760	87	6.50	3.00	3.50
15	1	60	12.20	73.9	94.9	872	1041	169	20.00	10.50	9.50
15	1	20	18.30	82.6	99.5	690	840	150	2.00	0.50	1.50
15	1	40	18.30	76.0	97.3	755	898	143	9.00	4.25	4.75
15	1	60	18.30	75.1	93.0	970	1125	155	26.00	16.00	10.00
15	2	0	12.20	71.8	98.1	605	683	78	2.00	0.50	1.50
15	2	20	12.20	74.5	99.0	580	672	92	2.00	0.50	1.50
15	2	40	12.20	72.9	91.4	688	723	35	6.00	3.50	2.50
15	2	60	12.20	73.4	94.8	883	1035	152	20.00	12.00	8.00
15	2	20	18.30	82.1	99.5	730	900	170	2.50	0.50	2.00
15	2	40	18.30	75.4	97.2	760	890	130	8.50	4.00	4.50
15	2	60	18.30	73.7	92.7	957	1099	142	26.00	16.00	10.00
25	1	0	12.20	16.7	38.6	503	451	-52	0.50	0.25	0.25
25	1	20	12.20	31.5	26.5	687	637	-50	4.00	3.00	1.00
25	1	40	12.20	37.4	45.6	712	666	-46	4.00	3.00	1.00
25	1	60	12.20	42.5	37.6	893	883	-10	14.00	8.00	6.00
25	1	20	18.30	29.6	27.3	680	680	0	0.50	0.25	0.25
25	1	40	18.30	38.2	35.9	766	750	-16	6.00	4.00	2.00
25	1	60	18.30	45.4	39.9	953	970	17	20.00	13.00	7.00
25	2	0	12.20	36.9	37.1	580	544	-36	0.50	0.50	0.00
25	2	20	12.20	36.9	30.1	565	536	-29	1.00	0.50	0.50
25	2	40	12.20	41.2	38.8	691	665	-26	6.00	3.00	3.00
25	2	60	12.20	47.2	44.7	866	890	24	16.00	11.00	5.00
25	2	20	18.30	29.4	25.4	705	734	29	0.25	0.25	0.00
25	2	40	18.30	42.7	40.0	771	793	22	7.00	5.00	2.00
25	2	60	18.30	51.9	27.3	942	975	33	22.00	14.00	8.00
25	3	0	12.20	21.1	36.1	497	425	-72	2.00	0.25	1.75
25	3	20	12.20	34.2	29.7	538	471	-67	1.00	0.50	0.50
25	3	40	12.20	41.2	44.8	666	629	-37	5.00	2.00	3.00
25	3	60	12.20	47.1	44.6	854	878	24	16.00	10.00	6.00
25	3	20	18.30	34.6	30.6	710	734	24	2.00	1.00	1.00
25	3	40	18.30	44.0	41.7	762	783	21	6.00	4.00	2.00
25	3	60	18.30	49.0	45.0	942	978	36	21.00	14.00	7.00